

THE PROPERTIES OF GROUND REACTION FORCE IN STANDING HOP, RUNNING THREE STEPS HOP AND HURDLE HOP

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INTRODUCTION: Both theoretical and experimental research has shown that the effect of the jump was highly related to the vertical reaction force of foot in contact. Current research has focused on the jump as it occurs in specific sporting activities. There is an apparent lack of research on basic jumps therefore the purpose of this study was to explore the characteristic of jump performance. Through measurement and analysis of dynamic properties of some common hops used in jump training, a significant contribution will be made to the knowledge base of this subject that will benefit athletes and coaches in many different sports.

METHODS: Five male university jumpers was recruited as subject in this study. They were experienced athletes, either winners or taking first runner up in jump events, such as long jump, high jump and triple jump in track and field contest of provincial universities. The average age, body height and body weight for subjects was 21.2 ± 0.85 years, 174 ± 3.7 cm and 64 ± 3.3 kg respectively.

After appropriate warm up exercises, all subjects was asked to perform at least three exercises for each of the three types of hop: standing hop, running three steps hop and hurdle hop. The jumping height was 41cm. All the exercises were performed on a computer aided 3D force platform system. Individual data included vertical force, foot contact times, and the direction of forces were measured and analyzed.

RESULTS: The hurdle hop showed the highest value of average vertical force and moderate foot contact time. Standing hop showed lowest force and longest time. Landing angles of vertical force in running three-step hop were similar to standing hop. While three step hop had takeoff angles that were equal to hurdle hop, the hurdle hop and standing hop showed smallest landing and largest takeoff angles respectively.

DISCUSSION: The properties of vertical jumping force depended on the load, mass and initial kinematics condition of human system. The main purpose of beating technique was to obtain the vertical speed. There was neither initial horizontal kinetic energy in running hop nor elastic potential energy of muscular in hurdle hop before foot contacting ground in standing hop. So this results showed the longest foot contact time and largest takeoff force angle in standing hop. It also showed that the initial height was the reason of the smallest landing angle in hurdle hop.

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