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Comparison of muscle activity in lower extremities between high jumpers and general athletes during running single-leg vertical jump over different distances

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INTRODUCTION:

The running vertical jump is a common action on sports fields, and most running vertical jump applies single-foot takeoff [1]. With special training, horizontal kinetic energy can be effectively converted into vertical kinetic energy. The speed of the approach run affects jumping performance, which is affected by the running distance. Therefore, the ideal jumping performance requires a balance between the vertical jump and the speed of the approach run. However, the differences regarding muscles and the speed of the approach run between professional athletes of jumping events and general athletes have rarely been discussed. The aim in this study was to determine how different approach run lengths affect single-leg vertical jumps. The jumping performance and characteristics of lower limb muscle activation of professional and general athletes were observed.

METHODS:

In this study, 23 junior college athletes divided into two groups: 11 athletes in the general group and 12 professional jumping-event athletes in the specialty group. The distance of the approach run was set to 1, 3, and 5 m from the force plate boundary. The participants were required to perform a vertical take-off with single-leg on the force plate after an approach run, and then land on both feet. Kinetic data were collected by Two Kistler force plates and seven Noraxon wireless EMG. The phase was divided into the pre-landing, landing, descending, and ascending. The statistical method used was two-way ANOVA, mixed design.

RESULTS:

In the pre-landing phase, 100 ms before landing, the activation of ST in the specialty group with a 1 m approach run was significantly higher than that in the general group; the activation of VL, RF, ST, and TA in the specialty group with a 3 m approach run was significantly higher than that in the general group. We further compared the effects of different distances on muscle activation. The results indicate that the activation of VL, RF, and VM with the 3 m approach run in the specialty group was much higher than with the 1 m approach run.

CONCLUSION:

We found that the rectus femoris and vastus medialis muscles with 1, 3, and 5 m approach runs were more activated than the hamstring tendons during the process of landing to take-off, which indicates that the main function of the quadriceps during the take-off process was to assist the knee joint to extend the knee and perform concentric contraction. In this study, different approach distances and groups were used to analyze the changes in the muscle activation of the lower limb during a single-leg vertical jump. We found that the degree of muscle activation in the specialty group was significantly higher than that in the general group for the different approach distances. Because vertical jump performance is closely related to the performance on the horizontal approach run, the results show that only those with a certain level of skill could achieve higher running vertical jump performance.

1. Alemdaroğlu (2012)

Topic: Biomechanics

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