

A STUDY ON THE SPRINT START IN SHORT-TRACK SPEEDSKATING

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INTRODUCTION: To a large extent, the sprint start in the 500-m short-track speed-skating event determines a successful performance. Therefore, it is anticipated that a study on the action in the sprint start would help to improve the outcome of the start. The aim of this study was to perform a kinematic analysis on some important factors that are related to a successful sprint start.

METHOD: The subjects for this study included 8 male and 8 female experienced skaters. The starting actions of the skaters, in the 500-m speed-skating event in the 1999-2000 World Cup Short-track Speed-skating Championships were videotaped using two video cameras (60Hz). One camera was placed to the front of the skaters, the other was placed to the left side of the skaters. The Peak Frame was placed at the first, third and fifth starting line and the 3-D DLT method was used for the camera calibration. Camera calibration errors of 0.057m were obtained from the camera .The data were analyzed on a motion analysis system (Aijie System). Zatsiorsky segment parameters were used to estimate the kinematics of the center of gravity.

RESULTS: The analysis on the actions of the best elite skaters showed the following results: In the initial posture, the body leaned forward. Using champion athlete W. as an example, the angle between the trunk and the horizontal plane was 13°. The trunk turned backward and formed an angle with the hip. In the process of sliding, the trunk first rose up, then bent downward to get into fast sliding. The swing of the body increased and the velocity of the forward motion increased quickly in the meantime. In the sprint start, the skater ran at the fastest step rate, and at the same time, controlled the step length, the head position, the blade angle and the inter-blade angle. Preparation status: The center of the body approaches the front supporting point of the body. After hearing the starting pistol, the athlete straightens the rear leg, raising the body. The slope of body moves from 13° to 28°. At this time, the center of the body immediately is at ground level and the speed increases to 2.95M/second. For the next step, the rear leg continues to straighten and raises the body further to 41°. The center immediately returns to ground level, and the speed increases to 3.82 M/second.

DISCUSSION: For the skating start, there are two kinds of initial posture: the planting style and the flat style. In the planting style, the skater could move into the start quickly. In the flat style, the trunk forms an angle with the lower limbs. This helps the skater to make use of the parallel elastic energy. When the trunk forms an angle with the lower limbs, the active muscles are stretched instantly, and the elastic energy is stored in the muscles and tendons. This stored energy could be used when starting. The head position played a significant role in the sprint start because of the posture reflex. In the sprint start, the body of the skater should lean sufficiently forward so that a better dynamic equilibrium and a larger horizontal force could be obtained. In addition, the center of gravity can be positioned closer to the start line.

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