INCIDENTS IN ALPINE SKIING GIANT SLALOM

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INTRODUCTION: Detailed description of running in alpine skiing can be performed using kinematic data - displacement, velocity, acceleration. This can be made according to the detailed geometry of a track including the setting of gates and according to the time intervals between slalom gates.
Up to now, investigations on alpine skiing were performed on a small segment of a track, i.e., 2-3 gates (Cotelli & Cotelli 1979, Nachbauer 1987). The authors of this paper presented data on investigations of the geometry of the giant slalom and the velocity and acceleration of skiers on a bigger track segment (10 gates) in Arachova, Greece (Erdmann & Giovanis 1995) and on the entire giant slalom in Noussa, Greece (Erdmann & Giovanis 1997).
The aim of this paper was a description of situations involved in incidents of skiers in alpine skiing giant slalom. By incidents we understand: falls, running over a pole, missing a gate.

MATERIAL AND METHODS: Investigations were performed of 64 skiers (41 men and 23 women) during the Greek Championships in Alpine Skiing in Noussa. Of the total number of skiers, 14 (21.9 %) had problems while running the giant slalom.
The geometry of the whole giant slalom, i.e., distances between all gate poles (vertical and surface), as well as all angles between them, were obtained with a geodetic theodolite. All runs were recorded with video equipment. Based on displacement and time, mean velocities and accelerations obtained between the gates were calculated. The coefficient of acceleration was calculated by dividing the absolute value of mean acceleration of the course by the mean velocity of the course ($|a| / v$).

RESULTS: The vertical drop of the entire giant slalom equaled 288.18 m and surface length (from pole to pole - 36 segments) 936.42 m. The mean gradient of the course's pole-to-pole profile equaled 17.86 degrees (S.D. = 4.23 O), the mean vertical drop equaled 8.01 m (S.D. = 1.78 m), the mean surface length from pole to pole equaled 25.95 m. (S.D. = 4.97 m). The angle of deviation, i.e., the angle between the extension of a line of the preceding distance between a gate's direction poles and the line of actual distance between the gate's direction poles equaled 24.8 degrees (S.D. = 12.3 O).
There were significant coefficients r of correlations between the velocity of running distances and characteristics of the giant slalom setting, i.e., length of distances between gates: 0.414, gradient of distances: -0.746, angle of deviations: -0.321.
There was a big difference in mean velocities of the entire course noted between the best three skiers (mean = 16.8 m/s) and the worst three (mean = 12.0 m/s).

The mean acceleration/deceleration data for the best three equaled 1.25 m/s^2 and for the worst three 0.55 m/s^2. Comparing the coefficient of acceleration between the three best skiers and the three worst, it was observed that the better the skiers, the greater the values of this coefficient: 0.075 and 0.048 respectively, although the correlation coefficient for the entire group was not significant. One could say there was an optimum range of that coefficient, which was the mean value +/- one standard deviation (0.053 +/- 0.008). Those who had a value above the optimum range ran a risk of being involved in an incident, while those who had a value below the optimum range did not run actively. The best skier had 0.059 and the second had 0.082, which was too large.
Of the entire number of skiers 7 men, i.e., 17 % of the men, and 7 women, i.e., 30 % of the women, had incidents while running the course. Two skiers had accidents (serious falls) while running one of the longest inter-gate distances, nine skiers (64 % of the skiers with incidents) had problems at the segment of the slalom where two gates were taken with one curve (one open + one closed gates), and at the third gate there was big angle of deviation of the course.

DISCUSSION: Every year many alpine sport skiers have incidents while running a course. This also concerns the best skiers in the world. This could be seen during the last Winter Olympic Games in Nagano. In order to prevent those incidents one has to analyze details of running. It appeared that those skiers who had incidents during the Greek Championships used poor techniques. Their coefficient of acceleration surpassed the acquired norm. Mean data of the coefficient equaled 0.077 and was significantly higher compared to the rest of the skiers.
During training sessions coaches must be aware of those skiers who do not run in an optimal way. In order to acquire knowledge on how skiers run, periodic tests should be performed including measurement of the mechanical details of skiing.

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