GEOMETRY AND RUNNING OF THE ALPINE SKI FIS WORLD CUP GIANT SLALOM PART THREE – VELOCITY AS A FUNCTION OF GEOMETRY

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INTRODUCTION: In order to evaluate setting of a giant slalom (GS) course one might use qualitative words such as: slow, medium, fast. This way of evaluation is subjective and inacurate. An objective method of describing a giant slalom course setting uses geometric data: distances between turning poles of the gates, angles of deviation and angles of incline. If one has a distance of running (through measurements of gate setting) and time of running (from video recording) then one can calculate velocities of running. This enables quantification of course setting. First experiments were done for Greek skiers, then for the best skiers in the world (Erdmann *et al.* 2000, Erdmann *et al.* 2001). The aim of this paper was to obtain objective way of evaluation of giant slalom course.

METHOD: Running of the competitors of Alpine Ski FIS World Cup Giant Slalom (January 1998) was recorded in Kranjska Gora (SLO) and in Saalbach Hinterglemm (AUT) after measurement of geometry of gates setting was performed. The procedure of obtaining the geometry of GS was presented in Erdmann *et al.* (2000). Runnings of 74 skiers (1st run) and 30 skiers (2nd run) in Kranjska and 69 skiers (1st run) and 29 skiers (2nd run) in Saalbach were taken into account. It was assumed a velocity of the inter-gate distance is a function of geometry of a course setting and of a previous velocity. In order to obtain a multi-regression equations: velocities of all inter-gate distances /1/, and mean velocities of the entire GS /2/ were taken into account:

$$v.i = (a \times v.i\text{-}1) + (b \times s.i) + (c \times \delta u.i) + (d \times \delta l.i) + (e \times \Theta.i) + f \qquad /1/$$

where: v.i - velocity of inter-gate distance, v.i-1 - velocity of the previous inter-gate distance, s.i – inter-gate distance length, δu.i - upper angle of deviation, δl.i - lower angle of deviation, Θ.i - angle of incline. All v.i were used for calculation of mean velocity for entire GS.

$$v = (a \times s) + (b \times \delta) + (c \times \Theta) + d \qquad /2/$$

where: v – mean velocity, s – mean inter-gate distance length, δ - mean angle of deviation, Θ - mean angle of incline; all quantities for entire GS.

RESULTS: The data on velocities were utilised for quantified evaluation of giant slaloms. Velocity coefficients for Kranjska and for Saalbach for the 1st and 2nd course were 16.91 and 17.01 and 17.77 and 17.77 (m/s) respectively.

DISCUSSION: By obtaining mean velocities as results of multi-regression equations it was possible to evaluate courses objectively. GS in Saalbach was faster than in Kranjska.

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