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Carving Technique – Methodical Perspectives

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Abstract

The alpine skiing has undergone major changes and adjustments due to both technological innovations of materials and update of theoretical and methodological concepts on all levels of specific training.

The purpose: the introduction of technological innovation in the field of materials specific to carving ski causes a review of methodology, aiming at bringing the execution technique to superior indices in order to obtain positive results.

The event took place in Poiana Brasov between December 2014 and March 2015, on an 800m long slope and comprised a single experimental group made of four males and four females, cadet category, that carried out two lessons per day. The tests targeted the technique level for slalom skiing and giant slalom skiing, having in view four criteria: leg work, basin movement, torso position and arms work.

As a result of the research and of the statistic-mathematical analysis of the individual values, the giant slalom race registered an average improvement of 3.5 points between the tests, while the slalom race registered 4 points. In conclusion, the use of a specific methodology applied scientifically, which aims to select the most efficient means of action specific to children's ski, determines technical improvement at an advanced level.

Keywords: carving ski, execution technique, slalom, cadets

Introduction

The alpine ski evolution has undergone major changes and adjustments due to both technological innovations of materials and update of theoretical and methodological concepts on all levels of specific training.

Carving ski represents a contemporary trend which requested major changes in its specific methodology with direct consequences upon the execution technique and temporal results.

The carved turn "is perhaps the greatest technical challenge on a ski slope, due to its specific construction. The technique consolidation through specific training has in view the following basic elements: force – skis, muscles and gravitation used in harmony, accuracy, relaxation and focus, oriented towards two aspects: the ground and the skiing method" (Balint G., 2005, p 15).

The technological innovation of ski shows modern features offered by both material properties and design, such as: the forces and momentums transferred from the ski runners to the ski bindings, the snow resistance acting upon the ski interface on the snow, the process parameters: angle cuts, position, velocity, acceleration, slope incline (Federolf P. A. 2005, p. 16).

In 2006, Federolf P. and collaborators stated: "as a ski passes over the snow surface in a carved turn the inclined skis penetrate the snow surface until the contact area suffices to allow snow of a given resistive strength to support the load exerted by the ski".

The carved turn is carried out on the ski's edge and alongside, avoiding the skidding as much as possible (DVS, Interschi Deurschland , 2002, p.8).

The technical analysis in carving by-pass contains the following elements: gliding, turning, rolling the skis from edge to edge (Kemler J. 2007, p. 40). The carved turns are determined by a dynamic position of the body during the turn, an optimum tilt and a minimum scend (Bogdan T, Lazar L, 2011, p 113).

When it comes to cadets, the turning technique acquired at performance levels is the foundation of future performances as juniors and later on as seniors.

The performance during slalom and giant slalom races is time-measured. Therefore, the speed is more important than the aesthetics or harmony of the turns.

Better results during events which require special turns, made the specialists reconsider the methodology behind the execution technique of the descent as follows: a wide trace on steep slopes and lateral tight turns chained alongside the slope; a lower position; quick bursts of turns, expanding the exterior leg during the turn phase, the fluency of the turns, permanent adherence to the ground; trigger precision and drive for the curve turns; cut drive of the turns, etc.

Hypothesis

An improved technique and new training guidelines in terms of carving ski, tailored to the race particularities and the competition track, specific to the ground, will cause the global efficiency increase of skis movement and the increased competitiveness of the athletes taking part in the experiment.

Methods

The experimental activity was carried out between December 2014 and March 2015, with medium level ski runners, members of A.S.C. Corona Brasov and enclosed two tests: the initial test at the start of the experiment, on December 2nd 2014 and the final test on March 20th 2015. The experiment took place in Poiana Brasov, on an 800m long slope, with 20% steepness; the observed events were slalom and giant slalom. The activity was divided into classes carried out in the morning, between 9 AM and 12 PM, and in the afternoon, between 2 PM and 4 PM.

The experimental group is mixed, made up of females and males in the cadet category (aged 14-15). As a result, the groups were made of two females and two males for each of the two races: slalom and giant slalom.

Testing: An assessment grid was applied during the research, to evaluate the technical aspect of the execution level, based on four criteria: leg work, basin movement, torso position and arms work, each one of them being noted from 1 to 10 for both ski races.

The main features of the giant slalom course include: 550m distance, with 35 gates, 30m width, 280m level difference, 20% steepness, as well as technical content: the 35 gates were horizontally alternated, with only right-left turns (red pole-blue pole), with no vertical gate. The interval between gates was of 12-16 m, and the width of the gates was from 10 to 12m.

The technical elements observed at the two giant slalom courses are the following:

For the leg work technique one focuses on the projection of the lower part of the body during by-pass, with extension and pulling legs under the body; rotation of the knees and ankles during the turn drive; lateral side push, perpendicular to the exterior ski, while rapidly slacking the upper ski laterally;

For the basin movements: in the trigger stage, the pelvis swivelling, turning the lower part of the body in the direction of the turn; the side projection of the basin;

For the trunk: the curved position of the trunk, forward position of the trunk;

For the arms work one focuses on: sideways position of the arms during the preparation stage, by-pass trigger; arms swinging down and forwards during the turn.

For the second race – slalom – the course features are: 450m length, 50 gates, 30m width, 20% steepness, level difference of 180m. Technical aspect: From the 50 alternating gates, 40 are laid out horizontally, with right-left turns and 10 are laid out vertically, interposed among the 40. These 10 gates are arranged on a technical structure as two "threads", a "double" and a "banana" following this system: for 10 horizontal gates, there's one vertical structure. Gate interval: 6-8m, gate width: 8-10m.

The technical elements observed at the two slalom courses are the following:

For the leg work technique one focuses on: main support on the exterior ski during the turn, independent leg work, bust deconstriction in favour of localizing the intense work on the knees and ankles;

For the basin movement: vertical and lateral movements of the basin; For the trunk: forward position of the trunk, ample anticipation movements and screw-arching movements;

For the arms work one focuses on: lateral position of the arms, arms action to remove pennants.

Among the means that were selected in order to improve the technique applied on the four components tracked during the classes, we note:

- Ex 1: descent through rhythmic slalom race (17 gates), made of pennants.
- Ex 2: same path as before, but working in pairs, one ski runner taking the route in slalom, the other one imitating it on the outside.
- Ex 3: downhill slalom by two parallel routes, alternating the unmarked trails with the marked ones, but the unmarked sequences correspond to the marked parts in the other slalom; short pennants can also be used.
- Ex 4: 17 gates – meandering on a slope with mounds.
- Ex 5: giant slalom route, 25-30 gates, with several benchmarks for one turn.

Results and Discussions

During this experiment, the initial and final tests were carried out under similar conditions in what the snow layer, consistency and temperature is concerned as well as track arrangement.

Giant slalom race

After the experiment it was observed that there is a significant difference of 3.5 points between the initial test and final test, the most important increase being registered on the technical aspect 1 (leg work) and 3 (torso position).

Table 1. Summary of values obtained on technical criteria during slalom race

Technical criterium/ Subiect, Test	M. P.			D. M.			L. M.			V. I.			Ş. A.		
	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI
Leg work	4	7	3	3	8	5	3	7	4	4	7	3	4	9	5
Torso position	5	9	4	4	6	2	5	7	2	3	6	3	5	8	3
Basin movement	4	7	3	4	7	3	5	8	3	3	7	4	5	9	4
Arms work	5	9	4	5	7	2	4	8	2	5	7	2	5	7	2
∑	18	32	12	16	28	12	17	30	11	15	27	12	19	33	14
X	4,5	8	3	4	7	3	4,25	7,5	2,75	3,75	6,75	3	4,75	8,25	3,5

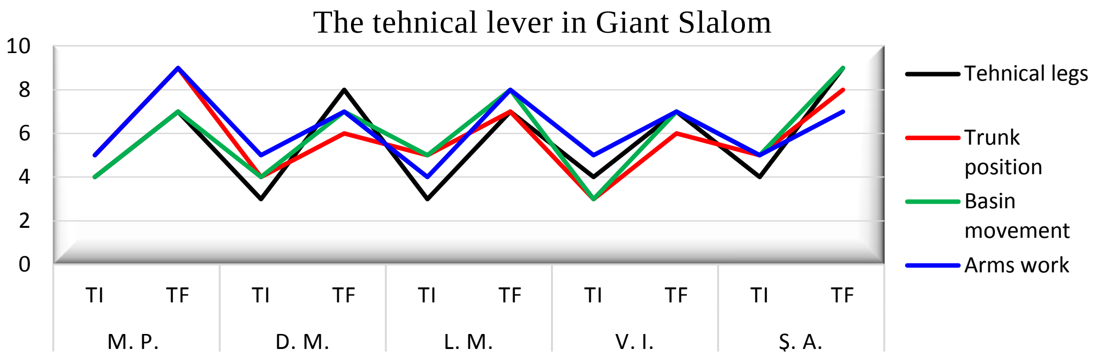

Fig. 1. Evolution of technicality level per criteria, during giant slalom race

Table 2. Calculation of the sum and square sum of differences between tests

Subject	Value TiI	Value TF	TF-TI =(d)	d^2
M.P.	4,5	8	3,5	12,25
D.M.	4	7	3	9
L.M.	4,25	7,5	3,25	10,5625
V.I.	3,75	6,75	3	9
S.A.	4,75	8,25	3,5	12,25
$\sum d/\sum d^2$			16,25	53,0625

Variance calculation

Sd = $\sqrt{}\{\sum d - [(\sum d)^2/n]\{$ / n-1 = $\sqrt{}\{53.06 - [(16.25)^2/5]\}$ / 4 = $\sqrt{}(53.06 - 52.81)$ / 4 = $\sqrt{}0.25/4$ = $\sqrt{}0.0625$ = 0.25. Standard deviation: Sđ = Sd/$\sqrt{n}$ = 0.25/$\sqrt{5}$ = 0.25/2.23 = 0.1121. The differences (d) are added up mathematically and the average is calculated: đ = $\sum d/n$ = 16.25/5 = 3.25. We set t = đ/ Sđ = 3.25/0.11 = 28.99, where t, represents the ratio of average between diffeences (đ) and standard deviation (Sđ).

Slalom race

There is a significant difference of 4 points between the two tests, the most important increase being on the technical component 2 (basin movement) 3 (torso position).

Table 3. Summary of results during the slalom race

Technical criterium/ Subiect, Test	F. P.			P. B.			D. D			Ş. A.			V. I.		
	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI	TI	TF	TF-TI
Leg work	4	8	4	4	8	4	3	7	4	3	9	6	4	8	4
Torso	4	8	4	5	7	3	2	7	5	4	8	4	3	7	4
Basin	5	9	4	6	8	2	3	8	5	5	9	4	3	8	5
Arms	2	7	5	3	9	3	4	8	4	6	7	1	5	8	3
∑	15	32	17	18	32	12	12	30	18	18	33	15	15	31	12
X	3,75	8	4,25	4,5	8	4	3	7,5	4,5	4,5	8,25	3,75	3,75	7,75	4

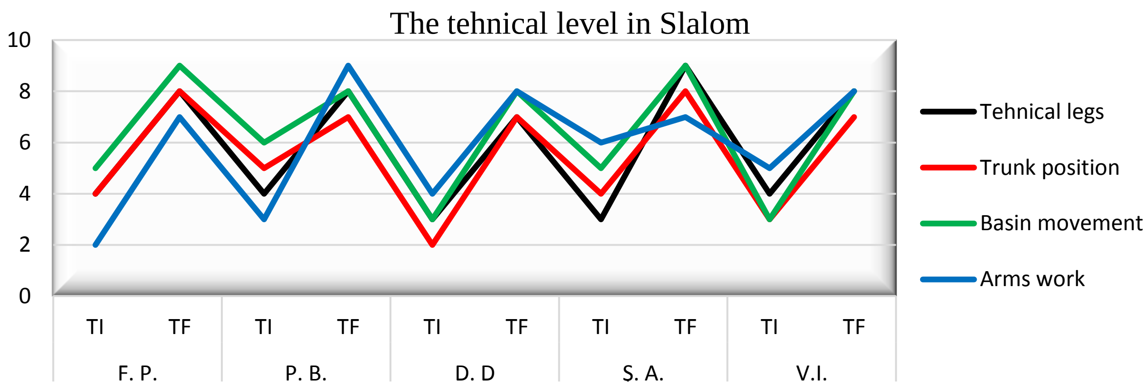

Fig. 2. Evolution of technicality level per criteria, during slalom race

Table 4. Calculation of the sum and square sum of differences between tests

Subject	TI	TF	TF-TI = (d)	d²
F.P.	3,75	8	4,25	18,06
P.B.	4,5	8	3,5	12,25
D.D.	3	7,5	4,5	20,25
S.A.	4,5	8,25	3,75	14,06
V.I.	3,75	7,75	4	16
∑d/∑d²			20	80,62

Variance calculation

Sd = √{∑d – [(∑d)²/n]{ / n-1 = √{80,62 – [(20)²/5]} / 4 = √(80,62 – 80) / 4 = √0.62/4 = √0.155 = 0.39. Standard deviation: Sđ = Sd/√n = 0.39/√5 = 0.39/2.23 = 0.17. The differences (d) are added up mathematically and the average is calculated: đ = ∑d/n = 20/5 = 4. We set t = đ/ Sđ = 4/0,17 = 23.52, where t, represents the ratio of average between diffeences (đ) and standard deviation (Sđ).

Discussions and Conclusions

As a result of the statistic-mathematical analysis, the value registered for the giant slalom race is t= 28.99, while t=23.53 for the slalom race. Our results are greater than 4.032, when p=0.01, f=n-1, the difference is significant, therefore the null hypothesis is declined. The progress was determined by the selected means of action using innovating features of the carving ski, which required improvements of technical elements that compose the tracked movements in the alpine races from this study.

As a result of the experimental study, the hypothesis is confirmed. In addition, the research results from implementing the means selected by its own methodology, confirm the specific hypotheses. During slalom and giant slalom races where the velocity indices prevail in the results, the technical component has a priority role, fundamental and necessary for high level performance.

The technical training methods used in the experimental activity were systematic, on technical-tactical levels of the two races: adjustment phase, consolidation phase, improvement phase (gates systems). Globally appreciated, the technical behaviour of the experimental group subjects is characterized by better coordination of the movement, prevailing location of lower-level movements, better sliding on skis in marked trails and better train of turns on steeper slopes and tougher snow.

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