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THE ROLE OF SPECIFIC AND NON-SPECIFIC TRAINING IN
ALPINE SKIING

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Abstract

In the vast majority of sports, as well as in alpine skiing, the value of sports performance has increased greatly, which has led to the intensification of sports competition spectacularity. Thus, increasing the training efficiency becomes mandatory both for coaches and athletes. The aim of the research is to identify efficient methods and means to optimise non-specific (land-based) and specific (on-snow) training in alpine skiing so that the best performance can be achieved. In order to carry out the research (case study), the athlete was assessed and measured using the Optojump analysis and measurement system by applying three tests: 60sec plyometric jumps, left-leg squat jump - 5 jumps and right-leg squat jump - 5 jumps in the precompetition and competition phases. This system recorded the results during the tests, giving us the opportunity to view the data recorded at any moment of the tests and to compare the performances in different tests. The research was conducted over 6 months of training, during which we used customised training programs, as well as participation in two rounds of the Alpine Ski World Cup, namely in two events – Downhill and Super G. The training programs proposed in the non-specific (land-based) training accepted by the athlete proved to be viable and efficient, this also being supported by the data obtained in the tests performed, while the results from the competitions emphasise the need to improve the specific training from the technical and tactical viewpoints.

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1. Introduction

Nowadays, thanks to sports specialists around the world who are constantly concerned with new methodological and practical searches, a whole series of sports have turned into high-level disciplines, including alpine skiing.

More than a sport, skiing is nowadays an activity in itself that influences and determines an important sector of the human activity and owes its importance and scale to strong social integration, which is a feature common to sports in general (Pelin, 2008).

Alpine skiing is a sports discipline “with its own field of expression, materialised by the content and execution of the competition events, which present an increased degree of complexity, dynamism, technique, difficulty, showmanship, elegance” (Toader, 2017, p. 4).

2. Problem Statement

In alpine skiing, the non-specific (land-based) training must not be dissociated and planned independently from the specific (on-snow) training and the whole complexity of the sports performance.

We know that, in skiing, the training process has as its central focus the on-snow training, and this is planned, completed and preventively ensured by the land-based training.

In order to analyse the data obtained in the training and compare them with the existing models worldwide, we used the computer. We also used it to establish workload schedules based on the best performances of each athlete, the prescriptions for training sessions and the design and planning of activities (development of prospects per Olympic cycle, annual plans, stage plans, micro-cycles and training plans) (Tudor, Moanță, & Ghițescu, 2013).

Therefore, in this study, we used the OptoJump analysis and measurement system by which three tests were applied: 60sec plyometric jumps, left-leg squat jump - 5 jumps and right-leg squat jump - 5 jumps. Optojump is one of the most advanced and high-performance systems for physical fitness assessment, being very efficient in the training of top-performance athletes, with notable influences on their competition results (*The next level of athletic fitness training*, 2011).

This system of analysis and measurement has been used in various studies (Graur & Făgăraș, 2013; Bosquet, Berryman, & Dupuy, 2009; Lehance, Croisier, & Bury, 2005), “which attests to the validity of the results obtained, the accessibility, through the lower cost, its portability versus other assessment tools, and its versatility that allows its use in assessment and research under specific conditions of both jumping and walking and also running” (Becea, Pelin, Branțeț, & Răchită, 2017).

What we intend through this study is to complete and define, as far as possible, certain aspects of this theme and perhaps to start new research directions.

3. Research Questions

If the specific (on-snow) and non-specific (land-based) training level of alpine skiers is known, are coaches helped to guide the training to achieve performance?

4. Purpose of the Study

We aimed to identify efficient methods and means to optimise non-specific (land-based) and specific (on-snow) training in alpine skiing to achieve the best performance.

5. Research Methods

5.1. Research subject and location

In order to carry out the research experiment, one Romanian athlete (A.V.) was subjected to this case-study research.

Before the experiment, the subject was verbally informed on the particularities of the test and the types of assessment used. He agreed to the way the experiment was conducted.

The research was conducted during 6 months of training, between July and December 2017, during which we used customised training programs, as well as participations in two rounds of the Alpine Ski World Cup, in two events – Downhill and Super G. The research was carried out in this way:

- on July 2, 2017, the initial test was carried out by applying the tests: 60sec plyometric jumps, left-leg squat jump - 5 jumps and right-leg squat jump - 5 jumps in Poiana Brasov;
- between July 3 and December 16, 2017, the training programs were applied to both the specific and non-specific training;
- in November and December - participation in the two stages of the Alpine Ski World Cup;
- on December 17, 2017, the final test was carried out by applying the three tests in Poiana Brasov.

5.2. Research techniques used

The following research methods were used: scientific documentation by which the theoretical foundation of the paper was laid, the experimental method, the graphical method and the test and measurement method.

In order to carry out the research (case study), the athlete was assessed and measured using the Optojump analysis and measurement system by applying three tests:

- 60sec plyometric jumps: starting position from standing, executing for 1 minute as many jumps as possible;
- left-leg squat jump - 5 jumps: starting position from standing on the left foot with the hands on the hip, with executing five successive jumps;
- right-leg squat jump - 5 jumps: starting position from standing on the right foot with the hands on the hip, with executing five successive jumps.

In our research, we used the Optojump system to assess anaerobic endurance strength and explosive strength. The data presentation was both tabular and graphical.

6. Findings

By applying the 60sec plyometric jumps test, we determined the level of anaerobic endurance strength, i.e. the relation between the upper level of expressing explosive c and maximum strength. Through this testing, we followed the maximum and minimum jump values and constancy in the initial and final

tests). The number of repeats was the maximum expressed within 60sec. We calculated the height of each jump, the arithmetic mean and the difference between the maximum and minimum jumps (Table 01).

Table 01. Results – 60sec plyometric jump test

Test	Max. jump height	Min. jump height	Mean	Rate of progress
Initial	34.8cm	5cm	23.05cm	29.8cm
Final	48.7cm	28.1cm	37.6cm	20.6cm

In the initial test (Figure 01), the best jump height achieved by A.V. is 34.8cm, the weakest is 5cm, and the arithmetic mean is 23.05cm. The jump rate was low, the difference between the maximum and minimum jump height being 29.8cm.

In the final test (Figure 02), athlete A.V. achieved better results, namely: the maximum jump had a height of 48.7cm and the minimum one of 28.1cm. The arithmetic mean of the jumps is 37.6cm, and the difference between the best and the poorest jump is 20.6cm. The progress between the two tests is 13.9cm for the jump with the best height and 23.1cm for the jump with the lowest value.

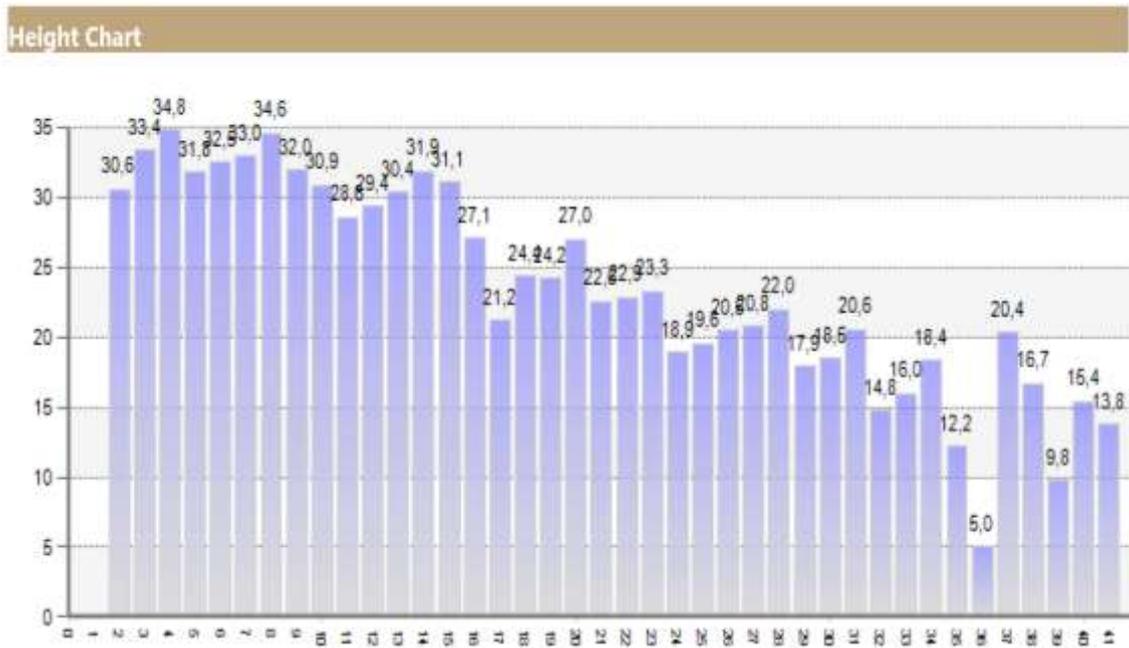


Figure 01. 60sec plyometric jumps – Initial test results

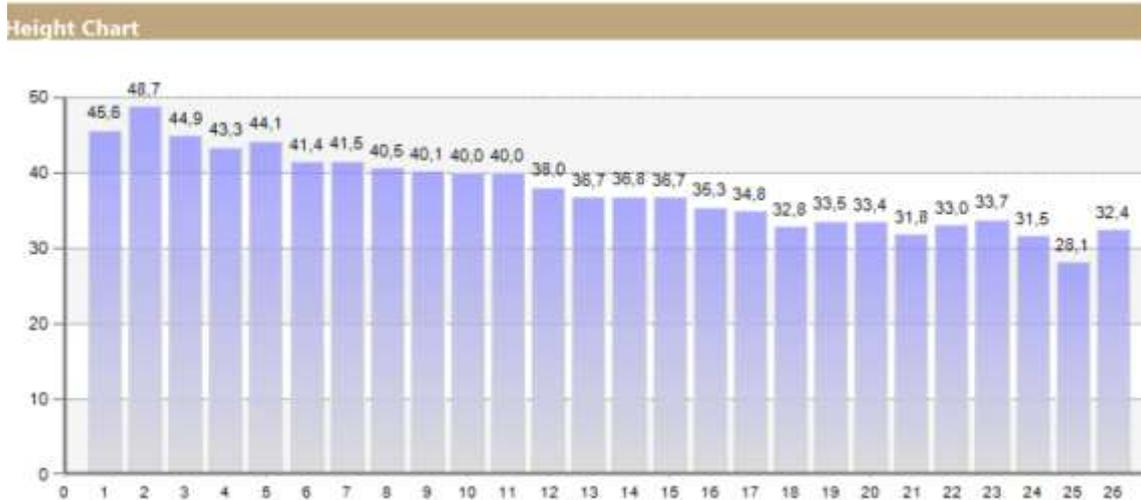


Figure 02. 60sec plyometric jumps – Final test results

Between the two tests, the training focused on developing explosive strength and endurance strength.

By applying the left-leg squat jump - 5 jumps and right-leg squat jump - 5 jumps, the level of expression of the explosive strength was determined for both the left and right foot. The maximum and minimum values were achieved in the 5 jumps by the explosive execution, both concentrated and at maximum for each repeat. We calculated the height of each jump, the arithmetic mean, and the difference between the maximum and minimum jumps (Table 02 and Table 03).

Table 02. Results – Right-leg squat jump - 5 jumps

Test	Max. jump height	Min. jump height	Mean	Rate of progress
Initial	21.4cm	17cm	19.02cm	4.4cm
Final	26.6cm	22.8cm	25.34cm	3.8cm

For the right-leg squat jump - 5 jumps (Figure 03), in the initial test, the arithmetic mean is 19.02cm. The best jump is the last of the five and has a height of 21.4cm, and the poorest is the fourth jump and has a height of 17cm, the height difference between these jumps being 4.4cm.

In the final test (Figure 04), the best jump of A.V. was the first and had a height of 26.6cm, and the poorest was the fourth, with a height of 22.8cm. The arithmetic mean is 25.34cm, and the difference in centimeters between the values of the two jumps (maximum and minimum height) is 3.8cm.

We can see that the progress achieved between the two tests is 5.2cm for the maximum jump and 5.8cm for the minimum jump.

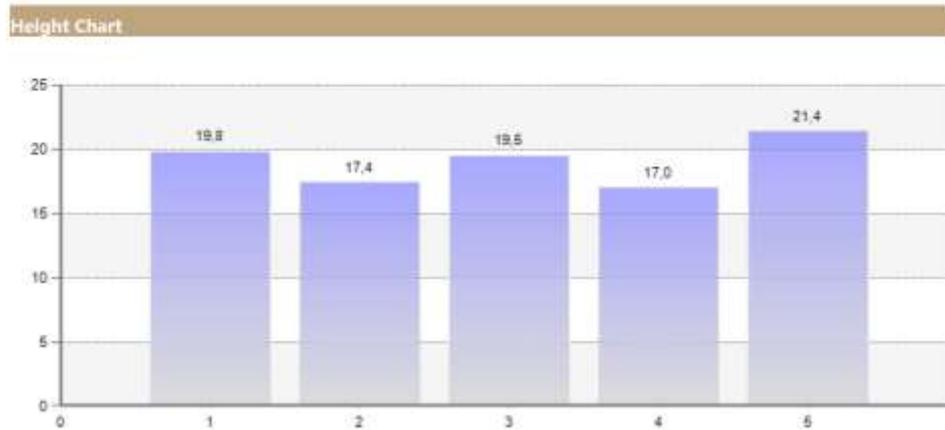


Figure 03. Right-leg squat jump - 5 jumps – Initial test results

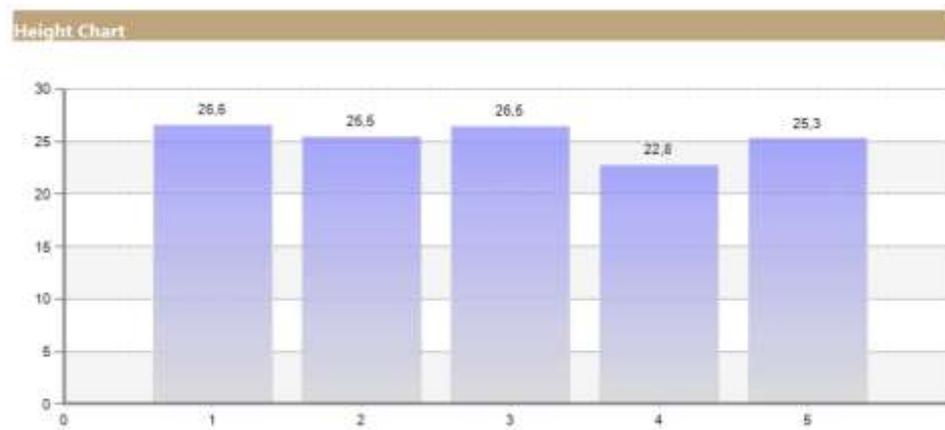


Figure 04. Right-leg squat jump - 5 jumps – Final test results

Table 03. Results – Left-leg squat jump - 5 jumps

Test	Max. jump height	Min. jump height	Mean	Rate of progress
Initial	21.1cm	17.1cm	19.66cm	4cm
Final	26.8cm	23.9cm	25.06cm	2.9cm

In the initial test (Figure 05), for the left-leg squat jump - 5 jumps, the arithmetic mean is 19.66cm. The third jump has the best height - 21.1cm, and the second jump has the lowest height - 17.1cm, resulting in a 4cm difference between the two.

In the final test (Figure 06), the arithmetic mean is 25.06cm, the highest jump is the third - 26.8cm, the lowest height jump is the fourth - 23.9cm, and the difference between the two jumps is 2.9cm.

We can note that the progress between the two tests is 5.7cm for the best height jump and 6.8cm for the lowest height jump.

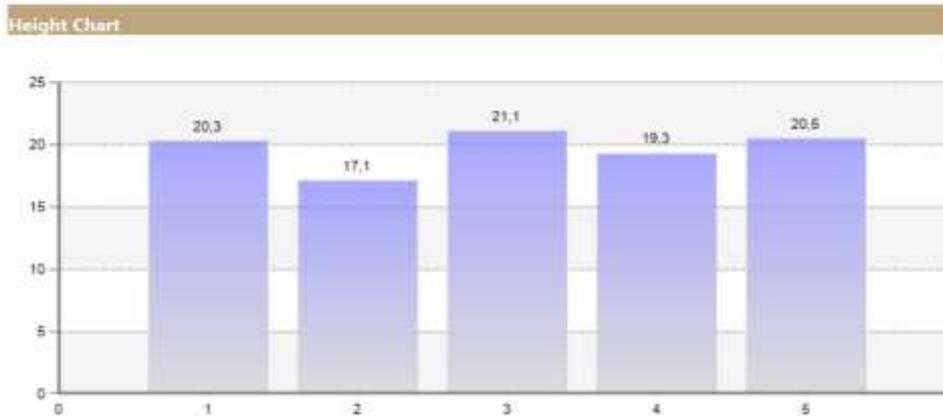


Figure 05. Left-leg squat jump - 5 jumps – Initial test results

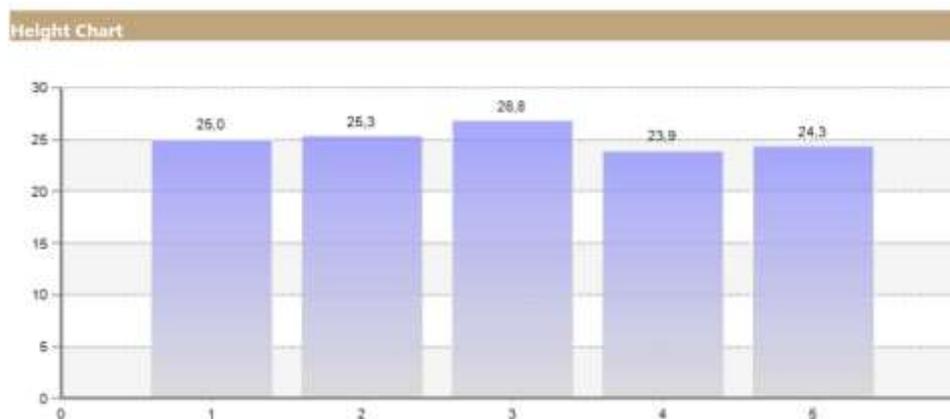


Figure 06. Left-leg squat jump - 5 jumps – Final test results

Between the initial and final tests, we intervened by using means to improve the explosive strength, which were in the 40-60% range of the individual maximum strength. The preparation during training sessions focused on developing the rapid strength with average resistance and the reactive strength through procedures combining different contraction speeds of the muscle fiber (slow, eccentric speed followed by rapid, concentric speed).

The on-snow training aimed at developing the specific effort capacity, as well as the motor qualities combined based on priority and involved based on differences, ultimately determining the specific efficiency in the speed tests (Downhill and Super G).

The results obtained in competitions by A.V., after participating in the two stages of the Downhill and Super G events at the Alpine Ski World Cup at Lake Louise (Canada) and Beaver Creak (the US), are shown in Table 04. Due to the fact that the four races took place on four different routes, in order to be able to distinguish between the results achieved by our athlete, it was necessary to compare the time recorded by A.V. with that of the winners of each race.

Table 04. Results in the Downhill and Super G competition events

Event	Results - Lake Louise			Results - Beaver Creek		
	First ranked	A.V.	The time difference between the first ranked and A.V.	First ranked	A.V.	The time difference between the first ranked and A.V.
Downhill	1:43.76 s	1:50.12 s	6.36 s	1:40.46 s	1:47.22 s	6.76 s
Super G	1:30.76 s	1:38.34 s	7.58 s	1:09.71 s	1:16.86 s	7.15 s

As shown in Table 04, the time difference in the Downhill event between the winner of the first competition and the Romanian athlete is 6.36sec in the first competition and 6.76sec in the second competition, resulting in a difference of 0.4sec between the times of A.V. in the two competitions. In the Super G event, the time obtained by the Romanian athlete at Lake Louise is with 7.58sec higher than that of the first-ranked athlete, while at Beaver Creek, it is with 7.15sec higher. By comparing the results obtained by A.V. at the Super G in the two competitions, we can note that, in this event, the time obtained in the second competition has improved by 0.43sec.

7. Conclusion

The results of the research clearly and concretely highlighted the role and importance of the non-specific training and the training programs applied in sports performance.

The training programs proposed in the non-specific training (land-based) accepted by the athlete proved to be viable and effective, this being supported by the data obtained during the tests performed, while the results from the competitions emphasised the need to improve the specific training from a technical-tactical viewpoint, the differences between the results obtained in the competitions being low.

As the sports mastery grows, the “specific difficulty” of the specific training increases. Thus, for the Downhill and Super G events, the specific training (on snow) must be done with strictly specialised means that develop the combinations of qualities that are prioritarily determined by the particularities of alpine skiing, the muscle groups engaged in effort, the type of demand and the subjective factors: the state of the snow, the weather conditions and the difficulty of the slopes.

In alpine skiing competitions, the level of performance is determined not only by the training programs, but also by a number of infrastructure factors, including the technical staff, physiotherapists, service-men and participation in many high-level competitions.

In conclusion, there is a close relation (from general to particular) between the specific and non-specific types of training, both conditioning the performance of the athlete.

Due to the fact that this research includes only one participating subject, being a case-study type, we consider that we cannot generalise the conclusions drawn, but we believe that the results obtained can open new directions of research.

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Authors’ contributions

All authors contributed equally to this paper and should be considered as main authors.

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