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Research Article

OPTIMISING THE DIAGNOSIS OF ALPINE SKIING SKIERS' PHYSICAL ABILITY

Giovanis V[1*]., Amoutzas K[2]., Giovani Ch[1]., Vlastari E[1]

[1]Physical Education and Sports Science, University of Athens
[2] Physical Education and Sports Science, Democritus University of Thrace

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A B S T R A C T

The aim of this research was to optimize the diagnosis of the physical abilities of alpine skiing skiers before and after the ski period. The sample consists of six different specialities of skiers – students of Athens University at periods 2009 - 2015 (n = 56). The following eight tests on the dry terrain were used before and after the ski period, in two consecutive days: 30m flight start, "octuple" jump, Slalom, Jumping up and down the step, Balance in slope on the one leg, Balance on both legs, "Dips" on the parallel bars, run 1000m and 600m for the men and women respectively. The statistical analysis included "t–test" for dependent samples and correlation analysis (a = 0.05). The results of this research were the following: the four of eight tests presented improvement to men's physical fitness after the ski period: eight continuous jumps, balance in slope on the right leg, slalom and run 1000m. While, women improved at: balance in slope on the right leg, "dips" on the parallel bars, balance on both legs and run 600m. There was a significant improvement to the total and mixed team of men and women at the 6 from the 8 tests.

INTRODUCTION

Optimizing the diagnosis of physical skills in skiing has been a subject of research and study by many scientists mainly abroad. After a brief review of the literature, the subject of research, as far as physical fitness is concerned, is approached by the following authors: Goodsell, (1994), Pilicz, (1997), Trześniowsk, & Pilicz (1989), Zak (1977). While, the issue of physical fitness research in the ski resort is approached by the following authors: Andersen, *et al*. (1990), Baka, & Aschenbrenner (2007), Baka, *et al*. (2007), Čillík, & Král (2008), Čillík, & Rázusová (2014). D'urbano, (1991), Elegańczyk-Kot, *et al*. (2008), Giovanis, *et al*. (2006, 2017), Giovanis, & Kotrotsios (2012), Haczkiewicz, (1976), Krasicki, *et al*. (1995), Kratter, & Marta (1991), Mester, (2007), Mondadori, (1986), Pernitsch, & Saudacher (1998), Staniszewski, *et al*. (2016), Tremtiaczy, (2004), Wojtyczek, *et al*. (2014). Raschner, *et al*. (2004), reports the three basic prerequisites in each skiing event, concerning both the attribute of the racing movement and the individual needs of the athlete, which are the following: 1) Knowledge of the athlete's specific parameters in a race. 2) Choosing the Appropriate Test. 3) Choosing the right training methods and exercises to achieve the goals. Skowronski, (2001) presented changes in the physical abilities of skiers (M = 23.3 years) due to dry ground workouts and pre-and CAMP 9-day trials at the ski resort of Zakopane, Poland.

Corresponding author:* **Giovanis V
Physical Education and Sports Science, University of Athens

The above researcher noted the improvement of the leg explosive force (jump test) and the ability to speed. Tchorzewski, (2005) compared the "Haczkiewicz" special test of dry ground skiing with the "Eurofit general test" at the same time. The research has been continuous for three years at a frequency of twice a year in ski-school students (aged 15 years after the start of research up to 18 years).

The training of the students took place 3 hours a day and included training on dry ground, snow, CAMP and races. The researcher concluded that only the two test tests - "Haczkiewicz" - were criteria for practical application: the "octuple" jump (eight consecutive jumps starting with the strongest leg with simultaneous ejection of the two feet before landing) and aerobic test (1500 m Men and 800 m Women). The above researcher proposed the "Eurofit" or the "International Test" (ICSPFT), or a combination of the two. Additionally, the creation of a directed test (simulation) and a special physical fitness test (for example, specified roller skating tests and on the snow respectively) for each winter sport was suggested as well. Therefore, the standardisation to be based on norms was recommended, by the researcher. This was the first time that norms were used. Krasicki, *et al*. (1995). The above tests are criteria for skiing talent selection and physical fitness indicator during the macro-cycle (the annual training cycle).

The purpose of this research was to optimize the diagnosis of the skiers' physical abilities and compare these physical abilities before and after a ski season. In the above study, the tests are proposed through imitating exercises where the

independent and dependent variables (the results of the tests) arise. The wording of the hypothesis was based on the following research questions: 1) Is there an improvement in the physical fitness of skiers after the ski season? 2) If so, then: Which tests and physical abilities show the improvement? 3) Is there a test choice criterion that can be a reliable simulation test for skiing? 4) Is the improvement due to the effect of the altitude, training or other random factors? 5) Is there a way to optimize the diagnosis of alpine skiers' natural abilities with a view to selecting talents? 6) Is there a comparison between the left and right leg? The measurements and limitations included in the research were carried out at the same premises of the University: a) in the same geographical area, in the same weather and at the same time of the day (always approximate); b) a sample of individuals with the same characteristics as: occupation, age and gender.

METHODOLOGY

Sample

The sample was derived from six different specialties of the University of Athens, skiing during the period 2009 - 2010 up to 2014 - 2015 (n = 56), where 33 were men and 23 women, 20-33 years old (22.34 ± 2.04), 160-195 cm (1.75 ± .08) and weighing 43-94 kg (66.43 ± 11.68). The body mass index (BMI) of the skiers had the following values: min 16.60 - max 26.30 (21.62 ± 2.29).

Means of data collection

For the diagnosis and comparison of the skiers' natural capacities, eight Alpine skiing trips on dry ground (Giovanis, 1989) were used on two successive days before the ski season (early December) and after the ski season (end of April) Tests are based on the eight-test kit (ICSPFT), which was released before the Eurofit (1991) test for physical fitness assessment (Zak, 1977; Trześniowski, & Pilicz 1989, Giovanis, 1989; Baka, 2007). The criterion for selecting a test was the result of a published research or a prospective survey, which will bring an answer whether the skiing test is valid and credible (see introduction: Skowronski, (2001), Tchorzewski, (2005) and Raschner, *et al*. (2004)). The special tests of Alpine skiing on dry ground were chosen by researchers and writers who presented the results of some tests with norms. The special tests of dry ground skiing were conducted as follows (Giovanis, 1989): 1) Path Speed Test (30m flight start). Two attempts were performed and the best was counted. 2) Explosive force test of the lower limbs ("octuple" jump - eight consecutive jumps with a simultaneous ejection of the two feet before landing). Two efforts were performed and the distance of the best effort was measured. 3) Agility Test (Slalom - 5m x 5m envelope shape). Two successive efforts were executed. 4) Anaerobic test (Jumping up and down the step 40cm on the one side, for 40sec). The number of iterations in one attempt was counted. 5) Static Strength Test of One Foot (Balance on inclined ground 45 ° on one leg (left and right)). The examiner retained the middle position of the ski pass. The time of an effort on each leg was counted. 6) Balance test on both legs (with bent knees at 90 ° angle and standing trunk resting e.g. on the wall). 7) Hand and Shoulder Strength Tests ("dips" on parallel bars). The number of iterations in one attempt was counted. 8) Aerobic test (endurance run 1000m and 600m for men and women respectively). The time of each attempt was counted.

Data collection process

While staying at the sea level, (until early December), the participants of this research had a training program of all physical skills three days a week. The training program included methods and exercises of all forms: for example general and imitating on dry ground (Giovanis, 1989, 2006). The stay of the same skiers at the Parnassos Ski Center was at an altitude of 1750-2300m for the practical part of the training course, while, their stay in Arachova was at an altitude of 1050m. The duration of the stay in the mountain was from 10 January to 10 April and more specifically three consecutive days each week. The training program included methods and special exercises in the snow (Giovanis, 1989, 2006).

Design

Factorial design (6 × 2 × 2) was applied, with 6 research teams, with pre - and post -skiing, with the last factor, gender (men and women).

Statistical analysis

Statistical analysis was performed with the SPSS 17 statistical program and a comparison of two correlated values was applied: 8 x 2 (eight test groups x two measurements: before and after the ski season). It included "t – test", p = two - sided, for dependent samples and correlation analysis at significance level $\alpha = 0.05$ with degrees of freedom df = n - 1. The statistical indicators presented in the following tables were: Deviation (SD), Standard Error (SE), Difference of Average (D). In the present study the necessary condition for the specific test to be valid is that "t" is greater than or equal to the value of the "t - test criterion (tc)". The zero hypothesis, which was the fact that after the skiing season there would be an improvement in performance in the 8 individual tests, and therefore the corresponding physical capabilities, was also examined.

RESULTS

Demographic details of participants

The age, gender and somatometric characteristics of the skiers who participated in the survey are shown in Table 1.

Table 1 Somatometric characteristics of the skiers who participated in the pre-ski and post-ski trips

SKIERS (n)	MEN (n =33)		WOMEN (n =23)		TOTAL NUMBER (n =56)			
	M	SD	M	SD	MIN	MAX	M	SD
AGE (years)	22	1,05	22,90	3,08	20	33	22,34	2,04
WEIGHT (kg)	74,47	7,61	55,70	6,38	43	94	66,42	11,68
HEIGHT (m)	1,80	,06	1,67	,05	1,60	1,95	1,75	,08
BMI (kg/m²)	22,93	1,60	19,94	1,93	16,60	26,30	21,62	2,29

Improving the physical skills of skiers in the best years

After the ski season, the improvement in physical fitness and the corresponding tests is presented according to gender in the years 2009 - 2015 as follows: a) In all years of men and women there was an improvement in performance in most trials where the difference (D) of the results after the season was not statistically significant. b) The "t – test" test rejected the null hypothesis and showed improvement in men in only 3 out of 8 trials in the following year: 2010-2011 ("dips" on parallel bars: t = - 2.492, p <.05, balance on both legs: t = 2.998, p <.03 and 5m x 5m slalom: t = 3.509, p <.02). While, in women the "t-test" also showed improvement in only 3 of

the 8 tests in the following year: 2010-2011 (Left Leg Balance: t = 2,659, p <.04, Bounce 40 sec: t = 2.717, p <.04, balance on both legs: t = 2.778, p <.03).

Improving the physical capabilities of men and women in all years

A considerable sample of men and women was used separately during the years 2009 - 2015 (Table 2). The "t-test" did not reject the null hypothesis and showed an improvement in the total group of men (n = 33) in 4 out of 8 "octuple" jump" trials t = 2.410, p <.02, Right Leg Balance: 3.432, p <.002, Slalom: t = 3.423, p <.002 and Strength 1000 m: t = -2.462, p <.02). While, in females (n = 23) the "t-test" also showed improvement in 4 of the 8 tests (Right Leg Balance: t = 2.072, p <.05, "Dips" on parallel bars: t = 2.510, p <. 02, balance on both legs: t = 3.799, p <.001, Strength 600 m: t = -2.830, p <.01).

Comparison between left and right leg

The sample of men and women was used separately and mixed (men and women) in the years 2009-2015. (Table 2 and 3). The "t-test" did not reject the null hypothesis and showed for the overall separate and mixed group improved balance (static strength) in the right leg relative to the left leg. The values were as follows: balance on the right foot in men (t = 3.432, p <.002) and in women (t = 2.072, p <.05), while, in the mixed group of men and women the criterion "t" was 3.733 (p <.001).

DISCUSSION – CONCLUSIONS

Skowronski, (2001) observed in his research the improvement of the leg explosive force and the reduction of the speed capability, whereas, the present research had only the overall results of the men of all ages.

Table 2 Comparison of the physical abilities of men (n = 33) and women (n = 23) before and after the ski season 2009-2015.

Year	τest - physical abilities (measuring unit)	Gender	Statistical indicators							
			Before			After			Differ-ence	T - TEST
			M	SD	SE	M	SD	SE	D	t, p = two-tailed, p ≤ .05
2009-2015	30 m – Speed (sec)	M	3.98	.35	.06	3.93	.32	.06	.05	p > .05
		W	4.81	.32	.07	4.73	.27	.06	0.8	p > .05
	"Octuple"jump – Explosive Power (m)	M	18.91	2.02	0.35	19.15	1.99	.35	.24	t = 2.410, p < .02
		W	13.66	1.02	.21	13.62	.82	.17	-.04	p > .05
	Balance – Left leg (min)	M	1.34	.63	.11	1.46	.61	.11	.12	p > .05
		W	1.38	1.08	.23	1.40	.98	.20	.02	p > .05
	Balance- Right Leg (min)	M	1.28	.56	.10	1.65	.65	.11	.37	t = 3.432, p < .002
		W	1.33	1.12	.23	1.77	1.40	.29	.44	t = 2.072, p < .05
	Jumps 40 sec (number of repetitions)	M	41.21	7.58	1.32	42.36	8.53	1.48	1.15	p > .05
		W	30.39	9.98	2.08	32.61	8.18	1.71	2.22	p > .05
	"Dips" on parallel bars (number of repetitions)	M	17.03	8.86	1.54	16.91	9.18	1.60	-.12	p > .05
		W	7.54	5.55	1.16	9.44	6.38	1.33	1.90	t = 2.510, p < .02
	Balance on both legs (min)	M	1.98	1.33	.23	2.31	1.38	.24	.33	p > .05
		W	2.29	1.82	.38	2.83	2.20	.46	.54	t = 3.799, p < .001
	Slalom - Agility (sec)	M	29.36	2.83	.49	27.82	2.58	.45	1.54	t = 3.423, p < .002
		W	30.69	3.52	.73	29.90	1.94	.041	.79	p > .05
	Endurance 1000 m 600 (min)	M	3.39	.34	.06	3.47	.38	.07	-.08	t = -2.462, p < .02
		W	2.88	.90	.19	3.02	.95	.20	-.13	t = -2.830, p < .01

Improving the physical capabilities of all skiers in all years

An increased mixed sample of men and women was used overall in the years 2009-2015. The "t-test" did not reject the null hypothesis and showed improvement in 6 of the 8 assays in the overall mixed group (n = 56) (Table 3). The two tests that did not improve were the "octuple": t = 1.589, p = .12 and the "dips" on parallel bars: t = 1.122, p = .27.

Tchorzewski, (2005) observed that only the two tests of "Haczkiewicz" were matching the criteria for practical application: stopping and aerobic test (1500 m Men and 800 m Women). The current study also had similar results only to the total group of men of all ages. The above interpretation can be justified by the following: similar results with the above researchers show the validity of the tests of this research,

Table 3 Comparison of physical capabilities of men and women (n = 56) before and after the ski season 2009-2015.

year	Test - Physical abilities (measuring unit)	Gen-der	Statistical indicators							
			Before			After			Differen-ce	T-test
			M	SD	SE	M	SD	SE	D	t, p = two-tailed, p ≤ .05
2009 - 2015	30 m – Speed (sec)	M+W	4.32	.53	.07	4.26	.50	.07	.06	t = 2.286, p < .03
	"Ocluple" jump – Explosive (m)	M+W	16.75	3.10	.41	16.87	3.18	.43	.12	p > .05
	Balance- Left Leg(min)	M+W	1.34	.83	.11	1.44	.77	.10	.10	p > .05
	Balance- Right Leg (min)	M+W	1.30	.83	.11	1.70	1.02	.14	.40	t = 3.733, p <.001
	Jumps 40 sec (number of repetitions)	M+W	36.77	10.1	1.35	38.36	9.62	1.29	1.59	t = 2.070, p < .04
	"Dips" on parallel bars (number of repetitions)	M+W	13.13	6.96	1.20	13.84	8.89	1.19	.70	p > .05
	Balance on both legs (min)	M+W	2.11	1.54	.21	2.52	1.77	.24	.41	t = 2.905, p < .005
	Slalom - Agility(sec)	M+W	29.91	3.17	.42	28.67	2.54	.34	1.24	t = 3.411, p < .001
	Endurance 1000m 600m (min)	M+W	3.18	.67	.09	3.28	.70	.09	-.10	t = -3.748, p < .001

something that applies only to the group of men of all ages. This is probably due to an increased sample of men compared to the female sample. In conclusion, in the above survey, the 2010-2011 group experienced the most distinctive improvements in 3 out of the 8 tests and the corresponding physical capacities in men and women respectively, whereas at the test of balance on both legs there was improvement in men and women.

The "t-test", can lead to optimal diagnosis as a test choice criterion, since it did not reject the null hypothesis and showed improvement in the total group of all, 2009-2015, men and women, in 4 out of 8 trials, respectively. The most frequent improvement in all years was the following: men improved at "dips" on parallel bars, balance on both legs and 5m x 5m slalom; while, women had the most frequent improvement in the blast test for 40 seconds. In the overall and mixed group of men and women there was an improvement in 6 of the 8 tests. The two tests that did not improve were the "ocluple" jump and the "dips" on parallel bars. Valid selection of the test allows optimization of the diagnosis of Alpine skiing skiers' physical abilities. This entails selecting talents, assessing individual preparation and changing the level of the skiing. Improvement in performance may be due to the effect of altitude (due to stay), altitude training, dry ground training or other random factors. In such a case, a larger sample is proposed and compared with a control group that did not go up in altitude. It is suggested that, the comparison of the difference between the left and right legs is proposed, as the results of the equilibrium in one leg leads to the following interpretation: the basic requirement for a successful "parallel conventional or carving ski" is the minimum difference in the balance on both legs. In this study, the right is stronger than the left leg in men and women (Table 2 and 3). This means that, these people easily turn left and with difficulty to the right, while skiing. Therefore, for this issue to be resolved, it is necessary to strengthen the left foot with general exercises (eg in the gym), imitating exercises (in the countryside for example with rollers) and with specified exercises (for instance in the snow), so as both legs to become as equal as possible.

Reference

Andersen, R.E., Montgomery, D.L., Turcotte, R.A. (1990). An on-site test battery to evaluate giant slalom skiing performance. *Journal of Sports Medicine and Physical Fitness,* Volume 30, Issue 3, Pages 276-282.

Baka, R. (20007). *Problemy Aktywnosci Fizycznej studentow [Problems of Physical Activity of students]*. A.W.F., University of Gdańsk (in Polish).

Baka, R., & Aschenbrenner, P. (2007). Biomechanical Aspects of Skiing Technique Evaluation with the Use of Picture Methods. *International Congress of Science: „Mountain, Sport & Health",* Italy.

Baka, R., Aschenbrenner, P., & Giovanis, V. (2007). The role of physical fitness in teaching Alpine skiing [Ο ρόλος της φυσικής κατάστασης στη διδασκαλία του αλπικού σκι]. *15ο Διεθνές Συνέδριο Φυσικής Αγωγής & Αθλητισμού.* 18-20 Μαΐου 2007, Κομοτηνή (in Greek).

Čillík, I., & Král L. (2008). Effectiveness of teaching downhill skiing to beginners depending on ski length. *Antropomotoryka.* AWF, University of Krakow, No 43.

Čillík, I., & Rázusová. Z. (2014). Influence of a specialized training program on the changes in the level of balance abilities in 8–10 year old alpine skiers. *Acta Gymnica,* vol. 44, no. 1, 15–22.

D'urbano, G. (1991). *Sci Agonistico.* Sperling & Kupfer Editori, Milano (in Italy).

Elegańczyk-Kot, H., Pospieszna, B., Domaszewska, K. (2008). The investigation of physical capacity changes in yearly training cycle on Alpine skiers' example. *Antropomotoryka.* AWF, University of Krakow, No 43.

Giovanis, V. (1989). *Coaching in downhill skiing [Proponitiki sti chionodromia katavaseon]*. Ed. Chronopress, 1st Ed. Athens, pp. 283-286.

Giovanis, V. (2006). *Ski technique [Techniki tis chionodromias]*. Ed. Elvekalt Athens, pp. 207-208.

Giovanis, V. Tikos K., & Giovani, X. (2006). The effect of training at altitudes on the physical abilities of students of skiing specialty. *14th International Congress of Physical Education & Sport,* Komotini, 19-21 May p. 21 (242).

Giovanis, V., & Kotrotsios, S. (2012). The comparison of physical abilities between alpine skiing skiers' and tennis players. *Physical Education of Students. Scientific journal,* 2012, No 6, pp. 144-148.

Giovanis, V.F., Vasileiou, P.V., Bekris, E.M. (2017). The diagnosis and comparison of physical abilities of Skiers and Footballers. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports,* 2017;21(5):221–226.

Goodsell, A. (1994). *Your personal trainer.* Boxtree Limited, Broadwall House, London, p. 25.

Grabowski, H., Szopa, J. (1991). *EUROFIT – Europejski test sprawnosci fizycznej*. Wydawnictwo skryptowe AWF No 13, Krakow (in Polish).

Haczkiewicz, B. (1976). Pomiar sprawnosci fizycznej narciarzy juniorow. *Kultura Fizyczna i Sport. No 12.* Warszawa (in Polish).

Krasicki, S., Majoch, T., Tokarz, L. (1995). *Cross Country ski [Biegi narciarskie]*. Program Szkolenia Dzieci i Mlodziezy. COS, Resortowe Centrum Metodyczno -Szkoleniowe Kultury Fizycznej i Sportu. Warszawa, pp.113-118 (in Polish).

Kratter, G. & Marta, E. (1992). *Sci Para Jovenes. Metodo para progresar en la competicion*. Madrid (in Spain).

Mester, J. (2007). Stimuli and stimulation: Hypoxia and mechanics. Ed: Muller E. *et al*., *Abstract Book of the 4th International Congress on Science and Skiing.* University of Salzburg , December 14-20, 2007, St. Christoph am Arlberg, Austria, p.28.

Mondadori, O. (1986). *Superguida dello sci.* Milano (in Italy).

Pernitsch, H. & Saudacher, A. (1998). *Konditions – training im alpinen Skirennlauf. Grundlagen bis Anschlussabschnitt*. Fachschriftenreihe des Osterreichischen Skiverbandes. Innsbruck 1998.

Pilicz, S. (1997). Measurement of general physical fitness [Pomiar ogolnej sprawnosci fizycznej]. *Studia i monografie nr 65.* Akademia Wychowania Fizycznego, Warszawa, pp. 32, 72. (in Polish).

Raschner, Ch., Patterson, C., Puhringer, R., Platzer, H.P. (2004). Special tests in alpine skiing [Testy specjalne w narciarstwie alpejskim]. *Sport Wyczynowy. Nr 5-6 / 473-474,* Warszawa (in Polish).

Skowronski, W. (2001). Motor skills of Polish representatives at the World Winter Special Olympics Games in Anchorage, Alaska USA '2001. Ed: Krasicki S. & Chojnacki K., *Zeszyty naukowe No 84. Sporty zimowe u*

progu XXI wieku oraz tradycje i perspektywy Zakopanego. AWF, Krakow, pp. 322-331.

Staniszewski, M., Zybko, P., Wiszomirska, I. (2016). Influence of a nine-day alpine ski training programme on the postural stability of people with different levels of skills. *Biomedical Human Kinetics,* 8 (1), 24-31, 2016.

Tchorzewski, D. (2005). Testing of the test to the specific Haczkiewicz under which the trafficking [Proba weryfikacji testu sprawnosci specjalnej Haczkiewicza pod katem jego trafnosci]. Ed: Krasicki S., *Studia i monografie No 31, Sporty zimowe, strategia rozwoju - badania naukowe.* AWF, Krakow, pp. 131-137.

Tremtiaczy, S. (2004). *The latest methods to improve fitness and physical performance.* University of Sydney, Australia.

Trześniowski, R., & Pilicz, S.(1989). Physical fitness tables for youth aged 7-19 [Tabele sprawności fizycznej młodzieży w wieku 7-19 lat]. *Z warsztatów badawczych [From research workshops]. AWF, University of Warszawa* (in Polish).

Wojtyczek, B., Pasławska, M., Raschner, Ch. (2014). Changes in the Balance Performance of Polish Recreational Skiers after Seven Days of Alpine Skiing. *Journal of Human Kinetics*, volume 44/2014, 29-40.

Zak, S. (1977). International physical fitness test (ICSPFT) scoring tables for young people aged 12-18 [Tabele punktacji miedzynarodowego testu sprawnosci fizycznej (ICSPFT), dla mlodziezy w wieku 12-18 lat]. *University of Krakow*, pp. 7-14 (in Polish).

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