SPE BALKAN SKI
Science, Practice & Education

1st Scientific Conference

SPE BALKAN SKI

Science, Practice & Education

BOOK OF ABSTRACT

Kopaonik, March 12th-16th, 2017

University of Niš

Faculty of Sport and Physical Education

1st Scientific Conference

SPE BALKAN SKI

Science, Practise & Education

(Kopaonik, Serbia, March 12th-16th, 2017.)

Book of Abstracts

Kopaonik, 2017.

1st Scientific Conference

SPE BALKAN SKI

Science, Practise & Education

Book of Abstracts

Publisher:

Faculty of sport and physical education , University of Niš

For the publisher:

Faculty dean, prof. Milovan Bratić, PhD

Editor in chief:

prof. Saša Pantelić, PhD

Printed by:

Medivest, Niš

Computer editor:

Predrag Živanović

Cover design:

Dragan Radojković

Circulation:

100 copies

ISBN: 978-86-87249-82-0

ORGANIZERS

Faculty of Sport and Physical Education, University of Nis

CONTACT:
info@balkan-ski.com
Faculty of Sport and Physical Education, University of Nis
Ljubomir Pavlovic, Ph.D.
CONFERENCE WEBSITE:
http://www.balkan-ski.com

First SPE BALKAN SKI will be organized in cooperation with
Serbian Ski Association,
Ski Instructors Association of Slovenia and
Science and Research Centre, Koper, Slovenia.

WITH THE PARTICIPATION OF:
Instructors And Trainers Asociation in Bosnia and Herzegovina **ATUS**
Montenegrin Association of Snowsport Instructors **MASI**

Organizing Committee

Chairman

Milovan Bratić, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Secretary

Ljubomir Pavlović, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Members

Vladeta Radivojević, President of Serbian Ski Federation

Nenad Stojiljković, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Zoran Milanović, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Saša Pantelić, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Tomislav Okičić, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Damijan Ambrožič, Organization and promotion of SPE BALKAN SKI, Slovenia

Tomaž Šegula, Organization of the SPE BALKAN SKI Demo SHOW, Slovenia

Scientific Committee

Chairman

Rado Pišot, Phd, Institute of Kinesiology Research, Science & Research Centre, Koper, Slovenia

Members

Saša Pantelić, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Blaž Lešnik, Phd, Ski Instructors & Trainers Association of Slovenia

Izet Radjo, PhD, University of Sarajevo, Bosnia & Herzegovina

Goran Sporiš, PhD, University of Zagreb, Faculty of Kinesiology, Croatia

Marco Narici, PhD, University of Nottingham, UK

Ron Kipp, Alpine Sport Education Manager at USSA, University of Utah, USA

Alberto Minetti, University of Milano, Italy

Jakob Bednarik, PhD, University of Ljubljana, Faculty of Sport & Science & Research Centre, Koper, Slovenia

Marko Aleksandrović, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Dragan Radovanović, PhD, University of Niš, Faculty of Sport and Physical Education, Serbia

Borislav Obradović, PhD, University of Novi Sad, Faculty of Sport and Physical Education, Serbia

Vujica Živković, PhD, University of Skopje, Faculty of Phisycal Education, Sport and Health, Macedonia

Siniša Kovač, PhD, University of Sarajevo, Bosnia & Herzegovina

Vjekoslav Cigrovski, PhD, University of Zagreb, Faculty of Kinesiology, Croatia

Bojan Matković, PhD, University of Zagreb, Faculty of Kinesiology, Croatia

Robert Ropert, PhD, University of Belgrade, Faculty of Sport and Physical Education, Serbia

General programme

12.3.2017 Sunday	
15:00-20:00	Registration Lobby of Hotel Angela
21:00-23:00	Welcome Coctail (Hotel Angela)
13.3.2017 Monday	
08:00-10:00	Registration Lobby of Hotel Angela
10:00-13:00	Snow Workshops
13:00-14:00	Lunch (Hany Bany restaurant) **
16:30-16:50	Invited Lecture *
16:50-18:00	Session 1
18:00-18:15	Openning Ceremony
18:15-18:30	INTERSKI Pamporovo – presentation
18:30-19:30	Key note lecture - Marco Narici
20:00-22:00	Dinner
20:00-22:00	Training Demo team
20:30-21:30	Board meeting
14.3.2017 Tuesday	
10:00-13:00	Snow Workshops
13:00-14:00	Lunch (Hany Bany restaurant) **
16:30-16:50	Invited Lecture
16:50-18:00	Session 2
18:00-19:00	Key note lecture - Alberto Minetti
19:00-20:00	Dinner
20:00-22:00	Demo Team Show

15.3.2017 Wednesday	
10:00-13:00	Snow Workshops
13:00-14:00	Lunch (Hany Bany restaurant)
16:30-16:50	Invited Lecture
16:50-17:10	Invited Lecture
17:10-18:30	Session 3
18:30-19:30	Key note lecture - Ron Kipp
21:00-00:00	Gala Dinner
16.3.2017 Thursday	
10:00-10:30	Closing remarks

* - All lectures, sessions and opening ceremony will be organized in Amphiteatre in hotel Angella

** - Hany Bany restaurant is located on the slope „Karaman greben“

Scientific programme - 1st SPE BALKAN SKI Conference

13.3.2017 Monday	
Keynote lecture	
18:30 – 19:30	**Exercise and musculoskeletal health: effects of alpine skiing** Marco Narici *Faculty of Medicine and Health Sciences, University of Nottingham, UK*
Invited lecture	
16:30 – 16:50	**Is it ski-school enough for contemporary winter entertainment** Jakob Bednarik, Rok Dokel *Faculty of sport, University of Ljubljana*
Session 1 **Chair persons:**	
16:50 – 17:00	**Smart sport equipment: an example of a Smart SKI** Anton Umek[1], Anton Kos[1], Milivoj Dopsaj[2] *[1]Faculty of Electrical Engineering, University of Ljubljana, Slovenia; [2]Faculty of Sports and Physical Education, University of Belgrade, Serbia*
17:00 – 17:10	**Does education level relate to skiing expertise and helmet use?** Lana Ružić[1], Matea Sedlaček[1], Bojan Matković[1], Mandica Vidović[2] *[1]University of Zagreb, Faculty of Kinesiology, Croatia; [2]Clinical hospital "Sestre Milosrdnice", Zagreb, Croatia*
17:10 – 17:20	**Inline skating contributes performance of adult recreational alpine skiers** Vjekoslav Cigrovski[1], Igor Božić[2], Bojan Matković[1], Ivica Franjko[1] *[1]University in Zagreb, Faculty of Kinesiology, Zagreb, Croatia; [2] University of Banja Luka, Faculty of Physical Education and Sport, Bosnia and Herzegovina*
17:20 – 17:30	**Raising awareness of athlete's skiing skills in free skiing and in line-up** Peter Sitar University of Maribor

17:30 – 17:40	**Connections of selected physical fitness tests and achievements in skiing competition in boys aged between 12 and 14** Matejek Črtomir, Jurij Planinšec, Stojan Puhalj *University of Maribor, Faculty of education*
17:40 – 17:50	**Systematization of alpine skiing techniques** Robert Ropret *University of Belgrade, Faculty of sport and physical education, Belgrade, Serbia*
17:50 – 18:00	**The balance differences in skiers with different level of adapted skiing technique** Marko Nikolić, Ratko Stanković, Saša Bubanj, Zvezdan Savić *Faculty Sport and Physical Education, University of Nis, Serbia*

14.3.2017 Tuesday

Keynote lecture

18:00 – 19:00	**Prevalent mechanical work and muscle contraction in Alpine ski: experimental vs. expected results** Alberto Enrico Minetti *Faculty of Medicine, University of Milan, Italy*

Invited lecture

16:30 – 16:50	**Skiing for the blind** Zbynek Janecka *Palácky University in Olomouc, Czech Republic*

Session 2
Chair persons:

16:50 – 17:00	**The influence of the ski helmets on sound localization and distance identification on ski slope** Lana Ruzic, Ivan Radman, Anton Tudor, Mario Kasovic, Vjekoslav Cigrovski *University of Zagreb ,Faculty of Kinesiology, Croatia*
17:00 – 17:10	**Trend of off-road skiing in Serbian tourists in period from 1991 till 2016** Dušan Mitić[1], Sreten Srećković[1], Goran Prebeg[1], Aleksandar Ivanovski[2] *[1]Faculty of Sport and Physical Education University of Belgrade; [2]College of Sports and Health, Belgrade*

17:10 – 17:20	**The relations between muscle contractile abilities and learning efficiency in adult ski beginners** Milivoj Dopsaj[1], Miroljub Blagojević[2], Goran Vučković[2], Nenad Koropanovski[2] *[1]Faculty of Sport and Physical Education, University of Belgrade, Belgrade; [2]Academy of Criminalistic and Police Studies, Zemun, Belgrade*
17:20 – 17:30	**Contemporary concepts of organizing winter activities for kinesiology students** Matej Plevnik[1], Mitja Gerževič[5], Saša Pišot[3], Bojan Šturm[2,4], Vid Baruca[4] and Rado Pišot[3,4] *[1]University of Primorska, Faculty of health sciences, Applied kinesiology, Koper, Slovenia; [2]University of Primorska, Faculty of Education, Koper, Slovenia; [3]Science and Research centre of Koper, Koper, Slovenia; [4]Ski Association of Slovenia; [5]MILLEO, Sport, Tourism and Education, Mitja Gerževič s.p., Izola, Slovenia*
17:30 – 17:40	**Natural factors as an element of the mountain tourism development in Serbia** Aleksandar Radivojević, Marija Dimić *University of Niš, Faculty of Sciences and Mathematics, Department of Geography*
17:40 – 17:50	**Bridging language and cultural obstacles in teaching alpine skiing** Saša Pišot[1,2] and Ana Pišot[2] *[1]Science and Research Centre, Koper, Slovenia; [2]SPORTART, sport education and design, Koper, Slovenia*
17:50 – 18:00	**Risks, safety measures and law regulation in the field of transportation of children and adults by chair lifts** Robert Ropret[1], Dragana Janačković- Ćupić[2] *[1]University of Belgrade, Faculty of sport and physical education, Belgrade, Serbia; [2]Ski Resorts of Serbia, Belgrade, Serbia*

15.3.2017 Wednesday

Keynote lecture

18:00 – 19:00	**The evolution of skill acquisition: From technique modelling to a neuromuscular focus** Ron Kipp *Ski Team Education and Development Manager for Squaw Valley / Alpine Meadows Race Team, USA*

Invited lecture	
16:30 – 16:50	**Recreational alpine skiing: evidence-based health promoting effects and risks** Dragan Radovanović *Faculty of Sport and Physical Education, University of Niš, Serbia*
16:50 – 17:10	**Correlation of motor dimensions of two generations of young athletes in alpine skiing in period from 2001 to 2010** Blaž Lešnik *Faculty of sport, University of Ljubljana; Ski instructors and trainers association of Slovenia*
Session 3 Chair persons:	
17:10 – 17:20	**Recycling and reusage of ski equipment** Mario Blagojevič *Ljubljana, Slovenia*
17:20 – 17:30	**Educating for excellence – the story of SIAS and credibility of Slovenian national alpine ski school** Blaž Lešnik *Faculty of sport, University of Ljubljana; Ski instructors and trainers association of Slovenia*
17:30 – 17:40	**Basic turn on a snowboard in two hours: workshop** Mitja Gerževič *University of Primorska, Faculty of Health Sciences, Applied Kinesiology, Izola, Slovenia; MILLEO, Sport, Tourism and Education, Mitja Gerževič s.p., Izola, Slovenia*
17:40 – 17:50	**Influence of morphological characteristics, physical fitness and ski technique on ski racing performance in girls aged 12 to 14** Puhalj Stojan[1], Lešnik Blaž[2] *[1]University of Maribor, Faculty of education, Department for sports training; [2]University of Ljubljana, Faculty of Sport*
17:50 – 18:00	**Quality of life in University students skiers** Saša Pantelić, Saša Veličković, Miodrag Kocić, Petar Mitić, Milovan Bratić *Faculty of Sport and Physical Education, University of Niš, Serbia*
18:00 – 18:10	**Students' injuries during skiing course practical teaching – the analysis of two study programme** Mladen Živković, Vladimir Antić, Petar Mitić, Nenad Stojiljković *Faculty of Sport and Physical Education, University of Niš, Serbia*

18:10 – 18:20	**The application of thermovision in skiing** Ljubomir Pavlović[1], Nenad Stojiljković[1], Ivana Bojić[1], Petar Đekić[2] and Zoran Milanović[1] *[1]Faculty of Sport and Physical Education, University of Niš, Serbia; [2]College of Applied Technical Sciences, Serbia*
18:20 – 18:30	**Long-life skiing is related to functional capacities in older age** Rado Pišot, Armin Paravlić, Saša Pišot *Science and Research Centre, Institute for kinesiology research, Koper, Slovenia*

Content:

UDK 796.61

Exercise and Musculoskeletal Health: Effects of Alpine Skiing

Marco Narici
Faculty of Medicine and Health Sciences, University of Nottingham, UK

Abstract: Exercise plays a major role in preserving muscle mass, strength, neuromuscular junction integrity and innervation, as well as acting as a key regulator of systemic glucose homeostasis. Few days of inactivity (sitting or bed rest) are sufficient to induce insulin resistance while 60 day of bed-rest induce alterations of the neuromuscular junction together with a marked loss of muscle mass and function. Similar changes are found in aging in which the loss of muscle mass and strength (sarcopenia) is very often accelerated by reduced physical activity and inflammation. However, it seems that maintaining an active lifestyle preserves muscle mass, strength and neuromuscular function and prevents denervation and loss of motor units. Because of the need of overloading skeletal muscle to prevent sarcopenia, most strength training programmes have been based on the use of commercial exercise machines. However, evidence exists that a recreational activity such as alpine skiing, which involves moderate to high eccentric and concentric loading, provides sufficient mechanical stimuli to induce muscle fibre hypertrophy and increase muscle strength. Indeed, after a 12-week guided skiing training (Salzburg Skiing for Elderly Study, SASES) in twenty-nine older men and women (>65 yr) we observed clear signs of muscle hypertrophy correlated with an increase in mechanosensitive muscle focal adhesion kinase (FAK) content, indicating significant remodelling of skeletal muscle induced by skiing. The present findings provide strong evidence that chronic inactivity has profound effects on musculoskeletal and neuromuscular system integrity. These changes are associated with important alterations in insulin sensitivity and in NMJ integrity. On the other hand, regular physical activity not only restores muscle mass and function but also affords protection against neuromuscular degeneration associated with an inactive life-style.

UDK 796.926

Prevalent Mechanical Work and Muscle Contraction in Alpine Ski: Experimental vs. Expected Results

Alberto Enrico Minetti
Faculty of Medicine, University of Milan, Italy

Abstract: Physics seems to indicate that the potential energy is the only one ought to be dissipated during the descent on skiis. Snow-ski friction and air drag are the best candidates, among forces, to generate the inevitable negative work. If muscles were involved, as it normally happens, eccentric contractions could be the prevalent activity.

Actually a simple, passive hardware model by Helmut Gottschlich and Hans Zehetmayer (1978) challenges those concepts. it shows that even a quasi-slalom trajectory can be achieved at no extra energy. This suggests to theoretical biologists and biomechanists that ski descent could be performed with no muscle intervention (which could be eventually just isometric) at all.

We know for sure that some isometric contractions are needed at least to maintain the body posture during the descent and, by looking at video footage, there are hints that some concentric work, even with the strategy of power amplification, is done.

In the speech we will review the expectations from physics, the specific literature about field experiments on this subject, and try to depict the 'perfect' set up capable to determine the prevalent muscle contraction type during skking. When those experiments will take place, results will help to better understand the biomechanics of Alpine ski disciplines and design training sessions and specific training machines for athletes.

UDK 796.01

The Evolution of Skill Acquisition: From Technique Modelling to a Neuromuscular Focus

Ron Kipp
Ski Team Education and Development Manager for Squaw Valley / Alpine Meadows Race Team, USA

Abstract: Acquiring the skills of skiing has historically been to copy the visual image the most proficient contemporary performer. This has an intuitive logic and works satisfactorily. Gross positions involving stance, balance, and force attenuation are not instinctual and must be acquired. Assuming skill acquisition is complete at this stage is premature. Interaction of the ski with the snow is essential for the ski to turn and can influence fatigue and enjoyment for the recreational enthusiast and performance for the ski racer. Ski/snow interaction has traditionally been overlooked as it is not easily seen by the observer. Even with high speed video shown in slow motion it is challenging to perceive. While equipment has improved to reduce vibration, the skeletal muscles must be trained to attenuate and manage ground reaction forces. While strong muscles are desirable, it is the kinesthetic contribution from those muscles that ultimately leads to greatest skill acquisition.

UDK 796.9.257

Is it Ski-School Enough for Contemporary Winter Entertainment

Jakob Bednarik, Rok Dokel
Faculty of sport, University of Ljubljana

Abstract: Ski schools are huge providers of sports tourism. Italy, Germany and Austria, sport tourism is one of the largest tourism providers. However, winter sports (skiing) holds third place for the most popular sports providers in this countries. A Similar situation is in Chez republic and Hungary. Only Slovenia and Slovakia has the privilege of having winter sports for their main spot tourism provider.

Ski seasons are becoming shorter, that is why tourism is more important throw the entire year not only between the winter (one season). One question is becoming more and more relevant, can ski schools survive only by teaching skiing in this winter season that is shortening.

Let's look at the facts. In Kranjska Gora there are five ski schools with a ski slope tax. Is that too much? Only this huge competition offers the tourist a choice of quality, price… Only one ski school is a part of a society (club) that organizes the ski cup and is also working on competitive skiing (all its businesses are focused on skiing). Other schools are parts of companies. Tow of this company's also work on renting ski equipment and repair it, also one of them has a bar. Two other companies have all of that and a bike renting business with organized tours. Only one of this companies has a sup renting business on a lake Jasna. This company has only 5% income from its ski school.

This facts, show us that a ski school cannot survive on its own, so it is used more as a side business this days. Which means that managers of ski schools need to have managerial and marketing experience

UDK 796.9.-056.262

Skiing for the Blind

Zbynek Janecka
Palácky University in Olomouc, Czech Republic

Abstract: Alpine skiing for people with visual impairments should be start around 6 -7 years of age. Methodology of skiing is very similar like is methodology of the normally seeing children. But we must respect the specificities of psychomotor development especially in the group of the congenitally blind children. What is diametrically different is their own motor learning. The process of learning is significantly slower and a lot of information the child feels the only by proprioception. This feedback process is for the child in the early stages of learning hardly perceptible. Learning by imitation, so typical for normally seeing children of that age, can not be used here. However, when the blind child receives basic skills of alpine skiing is able to ski in challenging terrain, use the lift and etc. Very important aspects is a safety movement on the ski slopes. The guide persons helps to blind skiers to find the right direction. Guide communicates with the visually impaired skier by a microphone and speaker. Phases of training for visual impaired are similar like for sighted athletes.

Competition for blind skiers are at the national level and international levels. IPC organize the European and World Cups for the blind athletes. Highest competitions for the blind skier are Paralympic winter games. Athletes with visual impairment compete in the same events as like as sighted athletes at the Olympics games.

UDK 796.015.926:61

Recreational Alpine Skiing: Evidence-Based Health Promoting Effects and Risks

Dragan Radovanović
Faculty of Sport and Physical Education, University of Niš, Serbia

Abstract: Recreational alpine skiing is not only limited to young, physically fit and healthy population but it often includes less fit individuals and a growing number of middle-aged and elderly skiers. They participate in alpine skiing for many reasons such as freedom of movement, joy of speed, socialization and mutual interaction, and the beauty of the mountains. Recreational alpine skiing is becoming increasingly safer due to the use of protective gear (helmets, hip pads, ski body armor, etc), introduction of short carving skis, more rigid and comfortable ski boots, and better preparation of ski slopes.The intermittent character of alpine skiing allows individuals to tailor their recreational skiing according to their personal health and physical fitness, in order to achieve an optimal skiing intensity while also providing an enjoyable experience. Physical load during a day of recreational skiing is usually characterized by the intermittent periods of the increased heart rate, followed by a longer recovery period, and the metabolic requirements in the moderate intensity range. Energy expenditure during alpine skiing can be maximized by using only short or no breaks during downhill phases, by choosing a more dynamic skiing mode (e.g. carving or short turn skiing), but also by increasing skiing speed or ski slopes grade. However, recreational skiing is associated with the prolonged eccentric quadriceps and hamstring fatigue, and a decline in eccentric hamstring strength could be a risk factor for injuries. Over the past decade numerous investigations have provided sufficient evidence that although recreational alpine skiing is a complex activity, influenced by many factors (e.g. individual ski technique, speed, turning radius and slope conditions), health promoting effects can be realized for cardiovascular, metabolic, neuromuscular and sensorimotor systems, as well as from a psychological perspective. A recreational skier can prevent injuries by developing appropriate physical fitness, with the emphasis on the eccentric types of endurance training, and also by a rational choice and a responsible behaviour on ski slopes, in order to optimize the benefit-risk ratio of alpine skiing.

UDK 796.926.012.1(2001-2010)

Correlation of Motor Dimensions of Two Generations of Young Athletes in Alpine Skiing in Period from 2001 to 2010

Blaž Lešnik
Faculty of sport, University of Ljubljana and Ski instructors and trainers association of Slovenia

Abstract: Based on the present study we observed the dynamics of the variations to motor status of two generations of young alpine skiers in ten-year period from 2001 to 2010. The subject sample included 58 young alpine skiers who, in terms of age (13 and 14 years), represented two U-14 generations (Gen1=2001/02; Gen2=2009/10) in category of young boys in official alpine ski competition system of Ski association of Slovenia. Developed model of potential success comprised 17 motor variables as a part of yearly official measurements for young alpine skiers realised before the ski seasons.

Based on the number of youth competitions of the highest level in Slovenia we developed a competition success model, which represented a success criterion in alpine skiing. The criterion variable is represented by a sum of points scored in competitions within the Hervis Cup (Gen1) in the 2001/02 season and Argeta cup (Gen2) in the 2009/10 season (Bandalo & Lešnik, 2011). We tried to increase the objectivity of the results by determining the criterion variable (actual competitive successfulness) on the basis of the system of points of the Ski Association of Slovenia. By using Pearson's correlation coefficients (r), we attempted to find the correlation between individual variables and success in competitions by individual year/generation. We determined that the trend of the number of statistically significant correlations between individual variables and the success criterion increased from 5 (Gen1) to 12 (Gen2).

The results of our study prove that higher ranked in Hervis Cup (Gen1; 2001/02) were competitors with better results in (one leg and two leg) take off power, strength of arms and the upper body and the ability to handle rapid changes in the direction of movement of the body in a limited space.

Significant correlations with competitive successfulness in Argeta cup (Gen2; 2009/10) have been calculated in 12 of total 17 motor variables. Besides 4 variables of strength, the significant influence with actual successfulness in last generation had also been detected at 2 variables of speed, 1 endurance and 5 variables of basic and special coordination (Bandalo, 2016). Proven larger number of statistically significant connections between measured motor abilities and competitive successfulness is also very important point of strategy and orientation of National program of development of Slovenian alpine skiing.

References

Žvan, M. & Lešnik, B. (2000). Correlation of Some Variables of Explosive Power and Competitive Successfulness of Boys in Alpine Skiing. *Kinesiology, 32(1)*, 40–46.

Bandalo, M. (2016). Dynamics of morphological and motor dimensions variations in young athletes in alpine skiing in the period from 2001 to 2010. Doctoral thesis. Ljubljana: Faculty of sport, University of Ljubljana.

Bandalo, M. & Lešnik, B. (2011). The connection between selected anthropometric and motor variables and the competitive success of young competitors in alpine skiing. *Kinesiologia Slovenica, 17(3),* 16-31.

UDK 796.2:678.028.6

Recycling and Reusage of Ski Equipment

Mario Blagojevič
Ljubljana, Slovenia

Abstract: We have introduced the route of the skiing equipment from the moment it became unusable, reusable or recycled. The goal of this presentation is to show society that we can in every segment in life like sport, work or the way we eat, rethink and do a better job of preserving the environment and have a smaller impact on it with the vision ZERO WASTE.

From a leading company in the field of gathering and handling with waste in Slovenia, we have gained some interesting statistical data, pictures of the collection center, ways of waste separation, sorting and handling of skiing equipment.

Then we visited the largest and newest regional center in the country. We oversaw the route of the used skiing equipment right up to the moment when it becomes a raw material for incineration. We have become familiar with the latest guidelines in the environment protection field and the modern technical approach for processing waste.

We have also visited two second hand shops which are specialized for giving the used skiing equipment another purpose, so it can be recycled as another usable thing in life and each of the stores had its own vision of doing that. We have found some interesting stuff, which were made from used skiing equipment.

We have found out that the companies we visited are years ahead of the others in the department of sorting and handling waste. When compared to other companies, we have also found out others are lacking the records of how much waste they have. We have had a look of the waste of skiing equipment produced in the past and have found out that the new guidelines and modern technological processes which are used in the waste industry are doing a great job of preserving the environment. The price is high, but we will have to pay it if we want to preserve our nature for the future generations.

Keywords: Recycling, ski equipment, waste, sorting, gathering

UDK 796.9.012.1

The Relations Between Muscle Contractile Abilities and Learning Efficiency in Adult Ski Beginners

Milivoj Dopsaj[1], Miroljub Blagojević[2], Goran Vučković[2], Nenad Koropanovski[2]
[1]*Faculty of Sport and Physical Education, University of Belgrade, Belgrade;*
[2]*Academy of Criminalistic and Police Studies, Zemun, Belgrade*

Abstract: Alpine skiing is a complex skill, and a very popular international winter recreation activity. As a sport, alpine skiing is also challenging in physical, technical, and tactical perspectives. Security agencies personnel, as police and army, must accomplish alpine skiing skills. Basic course very often occurs in specific circumstances which involve high physical intensity and short time realization (7-10 days). The aim of this research was to determine relations between levels of different muscle groups force and adopted basic skiing knowledge in the students of Academy of Criminalistic and Police Studies (ACPS).

Sixty-five ACPS male students, without previous skiing experience, participated in this study (BH = 182.1±5.2 cm, BM = 82.66±8.63 kg, BMI = 24.91±2.10 kg•m^{-2}). The adoption of basic skiing skill was criterion variable, featured through expertise mark at final practical exam (Ski Learning Efficiency Mark - SLEM). Predictor variables were represented by values of absolute and relative maximal isometric muscle force of: back extensors (BExt and BExt_rel), leg extensors (KneeExt and KneeExt_rel), left hand finger flexors (HGripL and HGripL_rel) and right hand finger flexors (HGripR and HGripR_rel). Muscular forces were measured two weeks before skiing course, and assessed by standard battery of tests: Dead lift, Standing Leg Extension and Hand Grip.

Basic descriptive statistical parameters were calculated for all results (Mean, SD, cV%, Std. Error). On the basis of Multiple Regression Analysis (MRA) the mathematical model for relations between criteria and predictive variables was established. The level of regression significant was defined at 95%, $p < 0.05$. Software SPSS Statistics 17.0 was used for all statistical analyses.

The results of basic descriptive statistics showed the following data's: SLEM = 7.58±0.81, HGripL = 60.46±7.57 DaN, HGripR = 63.88±7.22 DaN, KneeExt = 173.85±25.12 DaN, BExt = 180.23±23.32 DaN, HGripL_rel = 0.737±0.098 DaN/kg, HGripR_rel = 0.778±0.099 DaN/kg, KneeExt_rel = 2.120±0.338 DaN/kg, BExt_rel = 2.196±0.308 DaN/kg. MRA separated model explained 12.3% of common variance (R^2 = 0.123), at statistical significant level of F = 8.843, p = 0.004, with standard error of the estimate at 0.76 of mark. Only variable KneeExt_rel described defined model, while prediction equation has the following form: SLEM = 5.806 + (KneeExt_rel • 0.839).

The results showed that adopted basic skiing skill had significant correlation with relative isometric muscle force of leg extensors, during physicaly intesitive and time short skiing course (7 days), in students population.

Keywords: skiing, novice, isometric muscle force, efficiency of learning, students

Acknowledgement

This research is part of the project Effects of applied Physical activity on locomotor, metabolic, psychosocial and educational status of the population of the Republic of Serbia, under number III47015, which is financed by Ministry of Education and Science of Republic of Serbia – Cycle of Projects 2011-2016.

References

Dopsaj, M., Milošević, M., Blagojević, M. (2003). The relationship between success in basic skiing instruction and dimension of isometric knee extensor muscle force in students at Police academy. Bezbednost, 45(1): 43-57.

Muller, E., Schwameder, H. (2003). Biomechanical aspects of new techniques in alpine skiing and ski-jumping. Journal of Sports Sciences, 21: 679-692.

UDK 796.9.01

Does Education Level Relate to Skiing Expertise and Helmet Use?

Lana Ružić[1], Matea Sedlaček[1], Bojan Matković[1], Mandica Vidović[2]
[1]*University of Zagreb, Faculty of Kinesiology, Croatia*
[2]*Clinical hospital "Sestre Milosrdnice", Zagreb, Croatia*

Abstract: Skiing is an expensive recreation and in low land country residents it might be related to a higher income and higher level of education. The aim was to determine whether a higher level of education was related to better skiing skills and a decision to wear helmets, and to identify if a similar relation also existed in bicycle helmets use.

Survey including items about age, gender, level of education, level of skiing skills, behavior on the slopes and the frequency of wearing a ski helmet (and bicycle helmets if applicable) was administered to 554 skiers; age 39.3±10.1y (27- 81y); 152F/402M; 0.5% primary education (N=3, so excluded), 27% high school, 57% university degree, 16% PhD or Master of Science degree). They were categorized as advanced (level 6 and 7; 33%), average (levels 3, 4 and 5; 58%) and non-skillful skiers (levels 1 and 2; 11%) according to their skiing skills.

The hypothesis "People with a higher level of education will have a better knowledge of skiing" was confirmed (K-W ANOVA Chi-Square=33.114;p <0.001). Post-hoc test showed that respondents with a university degree skied better than subjects with high school education ($p<0.001$), and those with a scientific academic degree were the most skillful ($p<0.05$). results also showed that use of helmets actually decreases with the level of education (K-W ANOVA Chi-Square=9.189;$p<0.05$), and a difference ($p<0.05$) existed between high-school educated and those with scientific academic degree. Almost 61% of those with scientific academic degree, 52 % of those with university degree and 41% of high school educated subjects never wore a ski helmet.

Than the subsample of 240 bicycle users was extracted. There were no differences in wearing a helmet on a bicycle according to education level (K-W ANOVA p=0.245) and no significant correlation between wearing a helmet while skiing and on bicycle (Spearman R=0.009). The results show a low percentage (10%) of wearing a helmet on bicycle, even though the traffic for cyclists could also be considered as risky as skiing.

Education was related to skiing skills. Regarding the helmets, what was true for skiing, was not the case for cycling. In future, it would be interesting to get better insight into reasons for non-wearing a helmet in highly educated people (helmet might hinder accurate processing of audio information?[1]), and test more cyclists in oreder to better explain the relationships and possible risk taking theory[2].

References

Tudor A, Ruzic L, Bencic I, Sestan B, Bonifacic M. Ski helmets could attenuate the sounds of danger. Clin J Sport Med. 2010 May;20(3):173-8.

Lardelli-Claret P, de Dios Luna-del-Castillo J, Jiménez-Moleón JJ,García-Martín M, Bueno-Cavanillas A, Gálvez-Vargas R. Risk compensation theory and voluntary helmet use by cyclists in Spain. Inj Prev. 2003 Jun;9(2):128-32.

UDK 796.9.645.35

Inline Skating Contributes Performance Of Adult Recreational Alpine Skiers

Vjekoslav Cigrovski[1], Igor Božić[2], Bojan Matković[1], Ivica Franjko[1]
[1]*University in Zagreb, Faculty of Kinesiology, Zagreb, Croatia*
[2] *University of Banja Luka, Faculty of Physical Education and Sport, Bosnia and Herzegovina*

Abstract: Recreational skiers are usually not well prepared for the specific requirements during skiing thus risking the potential injuries. Conditioning trainings of elite skiers incorporate exercises of muscles and joints that will be active during skiing and offseason include activities such as skiing simulators[1] and/or inline skating. Inline skating is a practical activity which can easily be incorporated in every day timetable, the skills could also be tested[2], but little is known about its specific contribution to recreational level alpine skiing.

Overall 139 participants (average age 22.18±1.34 years), recreational alpine skiers, were included and attributed to two groups - control and experimental. Experimental group (n=72) participated in 10-days program of learning inline skating while control group (n=67) was not included in any kind of recreational program. Participants were tested before and after inline skating on six elements of alpine ski technique, which are usually incorporated in structured programs of alpine ski schools.

During initial testing there were no significant differences in the participants' level of alpine skiing. After finishing inline skating program, participants of the experimental group had better results on all elements of alpine ski technique (4.09 vs. 3.29; p=0.00).

Our results suggest inline skating aids better learning of alpine skiing. If beginners in alpine skiing would use inline skating in the preparation period, for alpine ski school it might help them to be more efficient in learning basics of skiing but also advance faster in elements of alpine ski technique.

Key words: inline skating, alternative sport, alpine ski knowledge

Refrences

Panizzolo FA, Marcolin G, Petrone N. Comparative Evaluation of Two Skiing Simulators as Functional Training Devices for Recreational Skiers. *Journal of Sports Science & Medicine*. 2013;12(1):151-158.

Radman I, Ruzic L, Padovan V, Cigrovski V, Podnar H. Reliability and Validity of the Inline Skating Skill Test. *Journal of Sports Science & Medicine*. 2016;15(3):390-396.

UDK 796.9:001.48

The Influence of the Ski Helmets on Sound Localization and Distance Identification on Ski Slope[1]

Lana Ruzic, Ivan Radman, Anton Tudor, Mario Kasovic, Vjekoslav Cigrovski
University of Zagreb ,Faculty of Kinesiology, Croatia

Abstract: Due to the high number of injuries on the ski slopes the ski helmets have become widely used protective gear. The aim of this study was to investigate the effects of wearing a ski helmet on auditory localization and sound distance identification in the frontal plane.

Twenty-three participants (6 female, 17 male; age 30.7±10.2) were tested on the slope with and without wearing the protective ski helmet in random order with six randomly alternating upcoming acoustic stimuli for each condition. Upcoming skiers from the back of respondents produced the specific ski sound stimuli. In both conditions each subject had to respond as soon as possible to different spatially distributed sound stimuli and to signalize the correct side of his/her arrival.

The results of the Wilcoxon Matched Pairs test showed statistically significant difference in ability to localize the specific ski sounds without and with wearing a protective ski helmet (72.5% ± 15.6% correct answers without helmet vs. 61.3± 16.2 with helmet; $p < 0.01$). In identifying the distance of the sound without and with wearing a helmet the results were also in favor of not wearing the helmet (Student t- test for dependant samples: without helmet on 73.4±5.56 m distance vs. with helmet on 60.29±6.34m distance; $p < 0.001$). In average, the subjects localized sounds 11% better without helmet and the performance on this test did not relate to whether they were used to wearing the helmet before ie. wearing a helmet did not lead to a positive adaptation on the sound localization in space ($r = -0.09$). The distance identification occurred 13m sooner without the ski helmets and in this case the results did depend on previous use of helmets ($r=-0.447$; $p<0.05$).

[1] published in IJOMEH, 2015

The ski helmets might limit the ability to localize the sound and interfere with the distance when the sound is firstly heard, as previously stated[1,2]. Although the overall protective value of the ski helmets is not arguable, due to the significant auditory limitations caused by wearing helmets its protection abilities role might be compromised. The skiers should be aware of that fact and accordingly adjust their behavior on the slope.

References

Abel SM, Boyne S, Roesler-Mulroney H. Sound localization with an army helmet worn in combination with an in-ear advanced communications system. Noise Health. 2009; 11:199-205.

Evans B, Gervais JT, Heard K, Valley M, Lowenstein SR. Ski patrollers: reluctant role models for helmet use. Int J Inj Contr Saf Promot. 2009;16(1):9-14.

UDK 796.9.01

Raising Awareness of Athlete's Skiing Skills in Free Skiing and in Line - up

Peter Sitar
University of Maribor

Abstract: As a specific sport genre, alpine skiing ranks among the top complex racing disciplines because of its never completely defined environment. On the one hand an extremely varied natural environment, filled with diverse weather conditions, snow preparations, and disparate terrain...! And on the other hand, as in all sports, the desire and need for professional work with the aim of achieving and pursuing the outstanding achievements.

Responsibility for creative and professional management is left to the coaches. Their ability for perception of the challenges, search for the necessary response to these challenges, planned professional guidance and the ability of the widest possible creations among the key content, are their most powerful weapon and a tool for successful work.

Competitor is in subordinate position in this relationship. Final environment is always created and defined by the coaches, with their lineups. Owing such a relationship and the specific environment, the role of coaches in alpine skiing is emphasized in demanding and responsible behaviour. For the correctness of the provision and protection of the highest professional standards of achievement in sport, as the responsibility for the attentive and professional work with competitors in optimizing the pursuit of the highest standards in the entire spectrum of diverse knowledge and skills.

Because of this COMPETITORS' exposure, a key task in the process of alpine skiing training is the highest possible level of their awareness. Without it, the creative participation in the training process is severly limited and generally less successful.

Extensive skiing skills are extremely valuable in competitive alpine skiing. Knowledge and mastery of the basics of skiing techniques are very important factors in both, competitors' own creation of their turns and in the process of deepening the quality of their

High level of creation of their own turns in free skiing and thereby achieved the highest capacity to adapt to the enforced (external) rhythm of skiing in the lineups, are fundamental for the correct path of development of a young athlete.

Based on the above mentioned reasons, the early and quality AWARENESS of skiing skills in free skiing and in lineups proves to be a valuable help and support in achieving the highest sporting achievements.

Its priceless value is highlighted in the deepening of the relationship with the sport, which becomes a noble dependence over the years.

Cooperation with the best skiers and their successfull sports performance are in the greatest extent possible the assurance for eligibility and need for such work. Investment in spreading the spectrum of skiing skills presents the skier with the ability of faster and higher quality quest for optimal response and correct decision!!!

In the present paper I will talk about the title subject, specifically to present my work and extensive experience with the best riders in the World Cup.

Keywords: skiing, creativity, correctness, awareness, competitors

UDK 796.926(497.12)

Educating for Excellence – The Story of SIAS and Credibility of Slovenian National Alpine Ski School

Blaž Lešnik
Faculty of sport, University of Ljubljana and Ski instructors and trainers association of Slovenia

Abstract: Slovenia is a northern Balkan country with a long tradition of skiing and excellent results in all snow sports. Our national ski-heroes as Bojan Križaj, Jure Franko, Rok Petrović, Mateja Svet, Jure Košir and many others paved very important historical way to Petra Majdič, Tina Maze, Peter Prevc, Žan Košir, Ilka Štuhec and others ski champions of Slovenian modern times. These results, which classified Slovenia among the best countries in winter sports, are not a coincidence but the result of well-planned professional and scientific experts' work of past and present generations.

Ski Association of Slovenia and its largest part Ski instructors and trainers association of Slovenia (SIAS) is the professional association representing one of the bases of the development of skiing in Slovenia. Its main goal is to educate a high-quality ski instructors and trainers and intensive cooperation with all racing ski disciplines. More than 80 years long tradition of SIAS has become one of the largest and most successful sports associations in Slovenia. In the past, over 20.000 ski instructors and trainers were educated and many of them were involved in the process of training world's most successful ski nations. Today SIAS consists of over 3400 members: about 83% - alpine skiing, 8% - snowboarding, 4% - cross country, 3%-ski jumping, 1%-freestyle and freeride skiing, 1%-telemark skiing. According to the level of their professional licence they are actively involved in the field of recreational skiing as well as in the training of top level professional athletes.

Slovenian national alpine ski school has always followed the novelties introduced by competitors and it has always been approved from educational and scientific aspect. In this paper we will present high technology measurements by using the Global Navigation Satellite System to prove the methodical progressivity and increasing of basic mechanic parameters (speed, force, energy loss…) of elements in hierarchy of Slovenian national alpine ski school (Lešnik, Žvan, Leskošek & Supej, 2013). Following these findings we can conclude that the ski school follows the principles of gradual progress and security.

Proper focus on systematic work with different target groups of learners and competitors is confirmed on one side by the high number and the quality level of recreational skiers and on the other side with the top results achieved at all competition levels. Strong cooperation between Faculty of sport (University of Ljubljana), SIAS/SLO DEMO TEAM and all categories of competitors based on individual approach to training of technique in all alpine ski disciplines.

References

Jarc, S. (2015). Basic mechanical parameters of elements in the Slovenian alpine skiing school. Thesis. Ljubljana: Faculty of sport

Lešnik, B. (2016). Hop, zavoj nekoč in danes: ob 80-letnici ustanovitve Zbora smuških učiteljev [Ski turn in the past and today: At the 80th anniversary of the establishment the Ski intsturctors and Trainers Association of Slovenia]. Ljubljana: Smučarska zveza Slovenije, Združenje učiteljev in trenerjev Slovenije

Lešnik, B., Žvan, M., Leskošek, B. & Supej, M. (2013) Progressivity of basic elements of the Slovenian national alpine ski school. *Acta Universitatis Carolinae. Kinanthropologica,* 49(1) 77-93.

Supej, M., Kugovnik, O. & Nemec, B. (2003). Kinematic determination of the beginning of a ski turn. *Kinesiologia Slovenica,* 9(1), 11-17.

UDK 796.9(497.11)(1991-2016)

Trend of Off-Road Skiing in Serbian Tourists in Period from 1991 till 2016

Dušan Mitić[1], Sreten Srećković[1], Goran Prebeg[1], Aleksandar Ivanovski[2]
[1]*Faculty of Sport and Physical Education University of Belgrade*
[2]*College of Sports and Health, Belgrade*

Abstract: Winter tourism is a riddle. The one, who comes to the mountain just that one time, falls in love with it and enters the category of those who always come back. The experience of skiing in cold but sunny winter day when valleys are dressed in fog is an experience left for joy even when the actual skiing is over. The whole day activity happens in an open landscape where there is a constant encounter with the slope and with your own skis and this is an added value to the feeling of going forward. In the same time it adds to you enjoying your own functioning.

By repeating our research in period from 1991 to 2016 we have come with four (4) outlines (1991-326 tourists[1], 1996-741 tourists, 2015-140 tourists and in 2016-172 tourists[2]), altogether 1379 tourists. We have used the Survey method in order to register the trend of changes in visitors of winter tourist destinations of Serbia.

The average age of the visitors to the winter tourist centers became higher, from 27 to 36.7 years.

The number of those avoiding skiing outside marked ski run downs is growing, from 40.5% to 57.3% while the number of those who try it sometimes is going down, from 38.7% to 28.7%.

The number of tourist afraid for their safety during skiing is also increasing, from 10.1% to 22.6%.

2016. In women, there is clear grow of constant fear of possible injuries, from 16.7% to 36%. In men, the trend is similar but it has lower intensity because the presence of fear grows from 5.3% to 14.3%.

The average time spent in skiing grows from 5.4 to 5.9 hours a day and owing to vertical transport, the person skiing crosses four to five times longer distances during the day.

By repeating our research four times and using the sample of 1379 tourist in period from 1991 to 2016, we have discovered and noted that there is higher number of visitors avoid skiing outside the marked ski run downs, increasing from 40.5% to 57.3%. In the same time we noted that the number of those trying it sometimes is declining, from 38.7% to 28.7%.

The number of tourist constantly fearing for their own safety during skiing, is also growing, from 10.1% in 1991 to 22.6% in 2016.

Acknowledgement

This article is the result of the project „Improving the quality and accessibility of education in modernization processes in Serbia" No III 47008, financially supported by the Ministry of Education and Science of the Republic of Serbia (2011-2017).

References

MITIĆ, Dušan. *Motivacione i sociodemografske karakteristike odraslih učesnika zimske rekareacije na Kopaoniku : magistarski rad*. Beograd: [D. Mitić], 1991. 177, [4] lista s tablama, graf. prikazi, tabele. [COBISS.SR-ID 512157868]

SAPUN, Zoran. *Motivacija za zimovanje naših turista u inostranstvu : završni rad*. Beograd: [Z. Sapun], 2016. 51 list, ilustr. http://phaidrabg.bg.ac.rs/o:13509. [COBISS.SR-ID514803628]

UDK 796.9.929

Basic Turn on a Snowboard in Two Hours: Workshop

Mitja Gerževič
University of Primorska, Faculty of Health Sciences, Applied Kinesiology, Izola, Slovenia; MILLEO, Sport, Tourism and Education, Mitja Gerževič s.p., Izola, Slovenia

Abstract: Based on my practical experience as a snowboard instructor for nearly 20 years and especially in the last seven years, teaching snowboarding as an additional activity in the framework of Winter Sports and Physical Activities in the Nature at the Applied Kinesiology study program at University of Primorska, I have adapted the classical methodical approach and developed my own procedure to teach the students a snowboard basic turn in two hours. During the 6-day winter camp at Forni di Sopra (Italy), around 40–45 students are divided in five to six skiing groups based on their knowledge and experience. The main activity at this winter camp is Alpine skiing and snowboarding is of only informative nature, performed once for each group for two hours. Since the learning process has its own interconnected and interdependent steps and phases which needs to be practiced and consolidated before passing from one to another, making a demonstration of snowboarding and trying to teach the students (in majority absolute beginners) as much as possible in two hours represents quite a big challenge for every teacher or instructor. This led me to synthesize my knowledge and experience in the field and structure this 2-hour lesson in the next 10 steps:

Step 1 – How to choose an adequate snowboarding equipment (boots, board, bindings) and defining the leading leg,
Step 2 – Injuries and safety considerations (equipment, warm-up, falling),
Step 3 – Fastening the bindings and adaptation to the snowboard basic position,
Step 4 – Adaptation to sliding straight with fastened leading leg,
Step 5 – Adaptation to sliding straight with both legs fastened,
Step 6 – Conclusion of the turn and stopping,
Step 7 – Inclined/diagonal sliding and initiation of the turn,

Step 8 – Making the basic turn (connection of Step 7 and Step 6),
Step 9 – Integration/linking of basic turns,
Step 10 – Enjoyment and self-experimenting.

During this workshop, the main exercises and ideas of each step will be presented.

UDK 796.9.015-055.15

Connections of Selected Physical Fitness Tests and Achievements in Skiing Competition in Boys Aged Between 12 and 14

Matejek Črtomir[1], Planinšec Jurij[1], Puhalj Stojan[1]
[1]*University of Maribor, Faculty of education, Slovenia*

Abstract: The purpose of the research was to determine the influence of selected physical fitness tests on the average time achieved in three giant slalom competitions in male alpine skiing competitors in category U14. The research was conducted on a sample of 20 categorized competitors (M = 12,5; SD = 0,513) that were in season 2013-14 competing in category U14. For assessing physical fitness three different tests (ten jumps on both legs, running eights and test of stability), were used. Those tests were selected based on previous studies (Bandalo & Lešnik, 2011), that showed strong connections of those selected tests and competition results. Performance in competitive skiing has been evaluated as an average result from three giant slalom competitions in Rauch cup in season 2013-14. With the help of multiple regression analysis, the connections of selected physical fitness tests and competitive success were calculated. Statistical significance was set at an α level of 0.05. The results showed that there was statistically significant correlation (p=0.000) between physical fitness tests and competitive success. Selected tests explain 76,6% variance of competitive success. Among these three predictors the greatest impact has *ten jumps on both legs* test (β=0,729; p=0,000), followed by *stability* test (β=0,312; p=0,018). Results also show that *running eights* test has no statistically significant impact (β= -0,097; p=0,420) on competitive success. As Le Master (2009) stressed, we should focus on those variables which in practice but also in accordance to the results of research studies provide the greatest number of information regarding competitive success. We can conclude that in the field of physical fitness *ten jumps on both legs* test could be the strongest predictor of competitive success in boys alpine skiing in category U14.

Key words: alpine skiing, motor abilities, young competitors,

References

Bandalo, M. & Lešnik, B. (2011). The connection between selected anthropometric and motor variables and the competitive success of young competitors in alpine skiing. *Kinesiologia Slovenica, 17* (3), 16-31.

Le Master, R. (2009). Applications of physics education research to skiing pedagogy for coaches and instructors. In E. Muller, S. Lindinger, & T. Stoggl (Eds.), *Proceedings book of the Fourth International Congress on Skiing and Science* (pp. 347–356). St. Christoph am Arlberg, Austria: University of Salzburg.

UDK 796.02

Smart Sport Equipment: An Example of a Smart SKI

Anton Umek[1], Anton Kos[1], Milivoj Dopsaj[2]
[1] *Faculty of Electrical Engineering, University of Ljubljana, Slovenia*
[2] *Faculty of Sports and Physical Education, University of Belgrade, Serbia*

Abstract: Smart sport equipment can support feedback in sports training and motor learning process. Smart equipment with integrated miniature sensors can be used as a standalone system or complemented with body-attached wearable sensors. Together with an adequate sensor fusion algorithms, it can help with developing better sport's gear, speed up the learning process and finally improve the skill level.

The main goal of our research is to prepare the technical conditions to prove the efficiency and benefits of the real-time biomechanical feedback when used in selected motion-learning processes. The feedback loop can be divided into a human (bio) and technical part. From the human perspective the technical part provides augmented feedback, from the perspective of the technical part the human provides biofeedback.

For the learning or improvement of new or already adopted simply or complex motor task learning visual biofeedback is extremely important. How to increase even simple and complex motor task learning efficiency is one of the most important concept in sport and physical education today. Especially, this is the case in skiing as a motor activity that required the integration of complex sensory input (visual, auditory and kinaesthetic) with fine motor responses as output motor reactions.

The research design is quasi-experimental and a mixed method approach where quantitative and qualitative data was collected. The paper presents our experience in designing the smart ski with integrated sensors. A prototype system SmartSKI was already functionally tested and verified by a group of alpine skiing experts. The prototype uses several sensors for measuring the action of the skier and the reaction of the skis and terrain at the same time.

The tests prove the appropriate sensor selection and the feasibility of implementation of the real-time biofeedback concept in skiing practice. The developed application allows the ski expert to analyze the performance of the skier based on several measured and calculated parameters that are presented to the skier as a concurrent or a terminal feedback. The application is currently capable of recognizing different phases of carving technique and diagnoses typical errors in regard to the load distribution during the steering phase of the turn. We are confident that in this way many benefits are possible for recreational skiers, ski equipment manufacturers, ski schools, coaches, and even professional skiers.

Keywords: smart equipment, biomechanical feedback, augmented feedback, motor learning, sport, skiing

UDK 796.015.012.1-0535

Influence of Morphological Characteristics, Physical Fitness and Ski Technique On Ski Racing Performance in Girls Aged 12 to 14

Puhalj Stojan[1], Lešnik Blaž[2]
[1]*University of Maribor, Faculty of education, Department for sports training*
[2] *University of Ljubljana, Faculty of Sport*

Abstract: Alpine skiing is characterized by highly intense sport that requires repetitive phases of high forces combined isometric and eccentric - concentric contractions. Vogt & Hoppeler (2012) argue that the modern competitive alpine skiing involves a high intensive tasks in duration from 60 to 150 s. Alpine skiing is characterized by high values of strength and endurance (Andersen & Montgomery, 1988). During the preparation period in the younger categories trainers should be focused on the major part based upon learning multi functionality, sport specific skills and complex motion sequences. These basic parameters should have been taught and acquired between the years from 10 to 14th.

The purpose of this study was using multiple regression analysis to identify independent impact morphological dimension, motor abilities and technique in a free and competitive alpine skiing due to competition performance 12 to 14 year girls. The survey was conducted on a sample of the 20s categorized racers from various Slovenian ski clubs. We used reduced models variables of morphological dimensions - MD (the volume of the left knee, body mass index (BMI),% body fat), motor abilities - MA (ten jumps on both legs, running eights, stability test) technique in free skiing - TEHFRS (balance, movement coordination and derivation of the curve) and technique in competitive skiing - TEHCS (balance, derivation of the curve and the line of skiing). For the criterion variable, we used the total sum of the points in the Slovenian cup in the season 2013/14. Statistically significant differences were observed in the levels of risk p <0:05. The results showed that all four areas of measurement explain 82.6% of the variance of the points won (R^2 = .826), so the effect of these predictors to competitive performance of girls is very high.

Shows may be that the results of technique in competitive skiing (p <.000) in girls significantly explain the share of points won. Noteworthy tendency affects Components MA (p = 0.067) and Components TEHFS (p = 0.080). The regression coefficients shows that achieved higher scores girls with better morphological dimensions and better technique in free skiing. The study raises key areas of research in the field of technique in the free and competitive skiing as two fundamental for achieving top results in competitive alpine skiing.

Key words: alpine skiing, body measurements, motor skills, technique

References

Andersen, R. E. & Montgomery, D. L. (1988). Physiology of Alpine skiing. *Sports Medicine, 6(4),* 210-21.

Vogt, M. & Hoppeler, H. (2012). Competitive Alpine Skiing: Combining strenght and endurance training: molecular bases and applications. *Science and Skiing V* (38-47).

UDK 371.212.796.9

Contemporary Concepts of Organizing Winter Activities for Kinesiology Students

Plevnik Matej [1], Gerževič Mitja [1,5], Pišot Saša [3], Šturm Bojan [2,4], Baruca Vid [4] & Pišot Rado [3,4]
[1] *University of Primorska, Faculty of health sciences, Applied kinesiology, Koper, Slovenia*
[2] *University of Primorska, Faculty of Education, Koper, Slovenia*
[3] *Science and Research centre of Koper, Koper, Slovenia*
[4] *Ski Association of Slovenia*
[5] *MILLEO, Sport, Tourism and Education, Mitja Gerževič s.p., Izola, Slovenia*

Abstract: Slovenia has a great tradition of skiing, since the written notes of the Bloke skiing are dated back to the year 1689. Therefore, it is not a coincidence that skiing is Slovenian national sport (Lešnik & Žvan, 2007). Movement on the snow in all its forms is the basis of all winter sports as well as an important part of leisure time activities (Pišot, Kipp & Supej, 2010). Winter activities are part of the educational programs in kindergartens, primary and secondary schools and university programs for many years now. In the framework of the study program Applied Kinesiology at University of Primorska, students are involved in a compulsory course Sports and Physical Activities in the Nature – winter part, with the aim of acquisition two main competencies: (i) to acquire methods and approaches for the introduction of individuals and groups for an effective use of leisure time and outdoor activities in winter time and (ii) to understand the content, purpose and process of physical/sports activities in the nature. Thus, in the first year of the study, a 6-day winter camp is organized in Forni di Sopra (Italy), which along with its infrastructure provides ideal conditions for effective implementation of the course in the extent of 1.5 ECTS. The content of the camp is divided into three parts: (i) the Alpine skiing course for all-level skiing knowledge (better skiers have the opportunity to achieve a professional qualification as a Ski Instructor – level 1 or 2); (ii) introduction to cross-country skiing and snowboarding, and (iii) additional winter activities and sports such as ice hockey, ice skating, sledding, night skiing, activities in the gym, swimming, and social activities.

Therefore, it was the aim of this study to evaluate the satisfaction and efficacy of the content of the described winter camp. An online questionnaire was send in January 2017 to all current and former participants where 88 students responded (31.4% respond rate). We were interested in students' subjective assessment of: i) the individual progress in skiing knowledge during the Alpine skiing course, ii) the success in achieving professional qualification of Ski Instructor – level 1 or 2 and iii) the overall satisfaction with the entire program of the winter camp. Among all respondents (age 21.5 ± 2.34; 62 % women), classified by the level of skiing knowledge, there were: 16 % beginners, 39 % average skiers, 23 % good skiers and 22 % very good skiers who have competed or achieved the Ski Instructor qualification. Respondents have detected significant progress in their ski knowledge (63 % good, substantial progress, 11 % excellent progress, and 26 % only slight progress), where the most significant progress was achieved by the beginners (38 %). Finally, we evaluated the satisfaction with the substantive realization of the entire program and satisfaction with the lessons applicable to future work as kinesiologists, where 57 % of the participants were satisfied and 41 % were very satisfied. Similarly, it was estimated that the acquired knowledge for further work is good for 17 %, very good for 55 % and excellent for 25 % of the respondents, while only 3% have answered that the acquired knowledge applicability as poor. Evaluation of the implemented activities provides us an insight into the students' (users) opinion about the quality of the activities undertaken during the winter camp, the quality of the organization and the adequacy of the competencies achieved by the students. Students' feedback open up also new possibilities for further improvements of the winter camp and its activities, maintaining the achieved level of quality of the program and to acquaint the students with the latest trends.

References

Lešnik, B., & Žvan, M. (2007). A turn to move on: alpine skiing - Slovenian way: theory and methodology of alpine skiing. Ljubljana: SZS–Združenje učiteljev in trenerjev smučanja.

Pišot, R., Kipp, R., & Supej, M. (2010). *Skiing is a game: Pedagogical and biomechanical foundations of learning to ski.* Koper: Univerzitetna Založba Annales.

UDK 338.48(497.11)

Natural Factors as an Element of the Mountain Tourism Development in Serbia

Aleksandar Radivojević, Marija Dimić
University of Niš, Faculty of Sciences and Mathematics, Department of Geography

Abstract: Serbia is the mountainous country since the surface area of above 1000m takes up 38.5% of the total surface area of the country. The mountains differ by origin, morphology, evolution, dimensions, vegetation, variety of hydrographic facilities and other features. If all the above is taken into consideration Serbia is able to develop different thematic forms of movement directed towards the mountains. However, the development of mountain area until this moment has not been adequatly exploited and valued. The aim of this paper is to point out the main comparative advantages of the mountain surface area of Serbia. The primary research in the paper will be directed towards the study of the resource base that would be able not only to satisfy the demand but also to form more complex offer of the mountain tourism.

Key words*:* natural values, Serbia, mountains, tourist infrastructure

UDK 338.48.65

Risks, Safety Measures And Law Regulation In The Field Of Transportation Of Children And Adults By Chair Lifts

Robert Ropret[1], Dragana Janačković- Ćupić[2]
[1]*University of Belgrade, Faculty of sport and physical education, Belgrade, Serbia;*
[2]*Ski Resorts of Serbia, Belgrade, Serbia*

Abstract: Skiing is the sporting activity with an increased risk due to speed and conditions of movement but also because of usage of different modes of uphill transportation. Greater number of injuries and fatalities indicate that mechanisms of uphill transportation are potetnial risk points. Every individual and the society in general have interest to: (i) eliminate or diminish risks, (ii) establish and apply measures of protection from risks that cannot be eliminated by the application of measures and (iii) determine and indicate the precautions to be taken in order to avoid the risks which cannot be eliminated by the previous two ways. The subject of this paper are the risks in the skiers' transportation and the current legislation effective in this field in the Republic of Serbia. By analysing the normative acts, we established the lack of legal regulations which would clearly define the obligations of the owners and operators of rope tows, obligations of users, especially parents as well as the conditions of transportation of children during training in ski schools. The paper offers real proposals for particular solutions.

Key words: skiing, transportation, chair lift, risks, rules

References

Zakon o javnim skijalištima (Sl. Glasnik RS, br 46/2006)

Zakon o žičarama (http://www.parlament.gov.rs/)

UDK 796.926

Systematization Of Alpine Skiing Techniques

Robert Ropret
University of Belgrade, Faculty of sport and physical education, Belgrade, Serbia

Abstract: Alpine skiing is sports and recreative activity that involves sliding down hills under the force of gravity, down a snow-covered surface (natural or artificial), using specific equipment, with an aim to control the speed by changing in directions. During skiing, the skiers apply different ways to change directions. The ways of direction changing differ according to the position of the body, interrelation of the body segments, turning movements, weight transfer on the skiis, amount of sliding sideways. There are differences in position between relation of skiis, movements done in the preparatory phase and during the phase of turn, duration, frequency and length of a turn. By analysing the above turn elements, taking into consideration the features of the snow surface and characteristics of skiing equipment, we have carried out the systematization of the two basic turn techniques and their variants.

Key words: Alpine skiing, skiing techniques, turn variants

References

Ilić, B (1988): Smučanje. Beograd. NIPRO Patizan

Ilić, B., Ropret, R., Ilić, M. (2010): Virtuelno alpsko skijanje. FSFV. Beograd

UDK 796.926.01

Bridging Language and Cultural Obstacles in Teaching Alpine Skiing

Pišot Saša [1,2], Pišot Ana[2]
[1] *Science and Research Centre, Koper, Slovenia*
[2] *SPORTART, sport education and design, Koper, Slovenia*

Abstract: Alpine skiing is no doubt one of the most popular winter sports in the world. Styles and patterns of sport involvement vary across cultures and their associated rules, rituals and ceremonies sometimes required adaptation or modification to fit particular culture stetting (Thomas & and Dyall 1999). When teaching alpine skiing we often clash to different obstacles in communication referring to languages and cultural differences of students. To verify existence and to identify the obstacles that ski teachers face with and strategies they use, were the main objective of our pilot study.

An on-line survey questionnaire "Language and cultural obstacles in teaching skiing" was sent to Slovene ski instructors in Slovene version and another to Japan ski resort in English version. The survey consisted of 25 questions about socio-demographic characteristics, teaching skiing experiences and strategies related to language and cultural differences of ski instructors. The respond rate of those who finished the survey was expectable low (18%), because of only 8 days of duration. 68 Slovene Ski Instructors (age 31 ± 8,4; 49% female), and 12 foreign Ski Instructors (age 27,5 ± 5,33, 58% female), together 80 respondents were participated in the research we focused on: i) existence of experienced cultural differences at teaching skiing; ii) most often obstacles in communication with foreign students; iii) satisfaction with achieved competences to teach multicultural students; iv) the adequacy of acquired competences and v) teaching strategies used to bridge the obstacles when appear.

: Data showed us slightly difference in the group of Slovene ski instructors (S) and foreign Ski Instructors (F), where experienced cultural differences were more evidences at foreign group (83%) than in Slovene group (51%). Most often obstacles for both group were incomprehension of the instruction (S=51%, F=40%) and incomprehension of the general question of the student status and wellbeing (F=41%). 13% of Slovene ski instructor evidenced intolerance among different students in the group. One third of both groups showed much or very much satisfaction of achieved competences for teaching foreign students in the frame of ski instructors' certification training, but there was a rather high percent (17%) of instructors of both groups who were not satisfied at all. Ski instructors have identified the greater need to get; i) more proficiency in foreign languages (S=76%; F=42%), ii) and social skills (S=21%, F=33%) and more knowledge about the cultural diversity (S=26%, F=25%). To overcome the language and cultural obstacles Slovene ski instructors mostly search for help from their ski-colleagues (S=49%) and none at their superior, while foreign Ski instructors most of the time (36%) use available sources (translators, internet…) and help from colleagues (27%) and only in 4% they refer to their superiors at ski schools.

Results from the pilot study could offer us and important baseline for further research with the aim to expand sociocultural consciousness (Villegas & Lucas, 2002), and acquisition of competences needed when teaching multicultural students alpine skiing.

References

Thomas, D. R. & Dyall L. (1999). Culture, ethnicity, and sport management: A New Zealand perspective." *Sport Management Review* 2 (2):115-132.

Villegas, A. M. & Lucas, T. (2002). Preparing culturally responsive teachers rethinking the curriculum. *Journal of teacher education* (1):20-32.

UDK 796.9.929

The Balance Differences in Skiers With Different Level of Adapted Skiing Technique

Marko Nikolić[1], Ratko Stanković[1], Saša Bubanj[1], Zvezdan Savić[1]
[1]*Faculty Sport and Physical Education, University of Nis, Serbia*

Abstract: The level of balance motor ability affects the athletes' success in alpine skiing and plays an important role in the injury prevention to alpine skiers (Cigrovski, V. et al., 2009). The aim of our research was to determine whether there is a difference in static balance motor ability in subjects-skiers with differently adopted skiing technique. The research included totally 32 participants, students of the Faculty of Sport and Physical Education, University of Niš, aged 22 years ± 6 months. The subjects were divided into two groups according to their level of skiing knowledge: novice skiers (N=16, TM 82,00±9.57) and advanced skiers (N=16, TM 80.25±10.11). The tests used to assess the balance (standing on the platform with the dominant and non-dominant leg, and opened and closed eyes, respectively), were conducted on the tensiometric (balance) plate along with the appropriate software, *Logger pro*[1]. The data obtained were processed by the t-test for independent samples. From totally four-balancing tests used statistically significant difference between groups of subjects was determined only in test dom_open (standing on the platform with the dominant leg, and with eyes open), at significance level of p = 0,017. Overall, it can be concluded that there is no statistically significant difference in the balance between skiers with different level of adapted skiing technique, which contradicts to some previous research (Ružić, L. et al., 2011).

One of the reasons of thus obtained results is probably insufficient difference between subjects in the level of adopted skiing technique, considering that the research involved students whose level of skiing was assessed by years of skiing experience.

T-Test

	t	df	p
dom_open	-2.528	30.00	0.017
dom_close	0.092	30.00	0.927
no_dom_open	0.573	30.00	0.571
no_dom_close	1.287	30.00	0.208

References

Cigrovski, V., Matković, B., Prlenda, N. (2009). Povezanost ravnoteže s procesom usvajanja skijaškog znanja. *Časopis, Hrvat. Športskomed. Vjesn. 24: 25-29.*

Ružić, L., Petračić, T., Rađenović, O. (2011). Povezanost ravnoteže s procesom usvajanja skijaškog znanja. *Časopis, Hrvat. Športskomed. Vjesn. 26: 52-57.*

UDK 371.212.616.001

Students' Injuries During Skiing Course Practical Teaching – The Analysis Of Two Study Programme

Mladen Živković[1], Vladimir Antić[1], Petar Mitić[1], Nenad Stojiljković[1]
[1]*Faculty of Sport and Physical Education, University of Niš, Serbia*

Abstract: The aim of the research is the analysis of Faculty of Sport and Physical Education students' injuries during practical skiing course and to determine if there was a change in the number and type of injury during different study program. The Bolognese reform of higher education in Serbia moved from a four-year study program of Undergraduate Studies to the Basic Academic Studies program. The application of new study program at Faculty of Sport and Physical Education, University of Nis was made in the 2007/2008 school year. Changing the study program meant that all subjects which were held during two or more semesters became one semester long with a larger number of classes. The subject skiing was two semesters long and its number of classes was 2+2 (lessons/practice) and it was held in the 3rd and the 4th year of studying, but the program of Basic Academic Studies is slightly different. This subject is one semester long and its number of classes is 3+3 and it's held in the 3rd and the 4th year of studying. Due to the increased number of lessons, and therefore the increased burden of students, there is a need to find the answer if the newer program brings with it a greater risk of injury during the exercises. The sample of participants in this study was 207(127 students of Undergraduate Studies and 80 students of Basic Academic Studies), aged 23 ± 6 months. The sample was divided into following subsamples for better comparison: male athletes (84 – US, 46 – BAS) male non-sportsmen (30- US, 14- BAS), female athletes (8- US, 8 BAS), female non-sportsmen (5- US, 12 BAS). A questionnaire was the measuring instrument used in this study. It contained the basic information about the participant such as sex, age and involvement in sport. The participants, who were injured while they were skiing, circled the type of injury. All data are numerically displayed and showed by the injury index. The analysis of the results shows that the number of injuries and the injury index is higher in the US program (11; 0.14) compared to the BAS program (7; 0.06).

We noticed that there was the increasing number of injuries and the injury index as well in US program at every level of subsamples except for male athletes where the results were the same in both programs. The results of this study show that the higher work intensity and number of lessons has led to the increasing number of injuries and the injury index and indicate the necessity of implementation of some protection measures. An adequate physical preparation, warm-up, good ski equipment as well as other factors would significantly reduce the occurrence of injuries.

UDK 796.01.371.212

Quality of Life in University Students Skiers

Saša Pantelić[1], Saša Veličković[1], Miodrag Kocić[1], Petar Mitić[1], Milovan Bratić[1]
[1] *Faculty of Sport and Physical Education, University of Niš, Niš, Serbia*

Abstract: World Health Organization defines the quality of life as a perception of one's position in life in the context of culture and composition of the values in which the individual lives, as well as in his relations with his own goals, expectations, standards and interests (WHO, 1996). There is a positive relationship between a physical activity and health, as well as the connection of physical activity with quality of life (Warburton et al., 2006; Bize et al., 2007), which is connected to a better mood, a positive experience of oneself, reducing the psychological and physiological stress (Berger & Motl, 2001). Skiing as a physical activity has involved an increasing number of people who engage in this activity in recent decades. Among them, there are many young people, especially students. The main objective of this study was to determine differences in the quality of life in relation to gender.

The sample consisted of 231 students, average age 22.06 ± 1.25 years, of which 148 men (64.1%) and 83 women (35.9%) of mean age. The requirement for participation was to know how to ski, and that they were skiing in the last 10 days. The quality of life was assessed by a shorter version of the questionnaire of the World Health Organization - WHOQOL which is internationally approved (Skevington et al. 2004). The questionnaire contained 26 questions grouped into four domains: physical health, psychological health, social relations and the environment, and provided the possibility of calculating the specific scores for each domain. All questions within the domains were presented on a five-level Likert scale. To calculate the difference in domains of men and women, t-test was used. The level of significance was defined as 0.05. The results were processed with the help of the statistical package STATISTICA 7.0 (StatSoft, Inc., Tulsa, OK, USA). Both male and female students have high scores of each domain and approximately the same estimation of their quality of life (Physical health 26.11 vs 26.54; Mental health 23.89 vs 24.42; Social relations 13.27 vs 13.29; Environment 32.41 vs 33 46). The results of t-test showed that there were significant differences only in the domain of Environment ($p = .038$) in favor of female students.

Quality of life is associated with physical activity, as confirmed by some studies (Berger & Motl, 2001). The obtained results are consistent with these studies, with a note that the estimated level of the quality of life in student population that enjoys skiing is at a high level.

As quality of life is a very complex phenomenon that depends on many factors, the identified differences between male and female students who practice skiing in domain of Environment, in favor of female students, should not be taken for granted. The concept of quality of life is influenced by individual experiences, beliefs, estimates, expectations (Testa & Simonson, 1996), and the obtained results are most likely consequences of the above. Generally, it can be concluded that skiing positively affects the quality of life of students who practice it because the estimated values in some domains are large and it can be recommended as a physical activity for both sexes.

References

Berger, B.G., & Motl, R.W. (2001). Physical activity and the quality of life. In R.N. Singer, H.A. Hausenblas, & C.M. Janelle (Eds.), *Handbook of Sport Psychology 2nd edition*. New York: Wiley

Bize R., Johnson J.A. & Plotnikoff R.C. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. *Preventive Medicine*, 45(6), 401-415.

Skevington, S. M., Lotfy, M., & O'Connell, K. A. (2004a). The World Health Organization's WHOQOLBREF quality of life assessment: Psychometric properties and results of the international field trial A report from the WHOQOL group. *Quality of Life Research*, 13, 299–310.

Testa M.A., & Simonson D.C. (1996). Assessment of quality of life outcomes. New England Journal of Medicine, 334(13), 835—840.

Warburton D.E., Nicol C.W. & Bredin S.S. (2006). Health benefits of physical activity: the evidence. *CMAJ*, 174(6), 801-809.

World Health Organization (1996). Programme on mental health. WHOQOL-BREF Introduction, administration, scoring and generic version of the assessment. Field Trial Version.

UDK 796.01.

Application of Infrared Thermography in Skiing

Ljubomir Pavlovic[1], Nenad Stojiljkovic[1], Ivana Bojic[1], Petar Djekic[2], Zoran Milanovic[1]
[1]*Faculty of sport and physical education, University of Nis*
[2]*College of Applied Technical Sciences, Nis*

Abstract: Infrared thermography is non-contact, non-invasive and non-radiating diagnostic method that can be used for detecting changes in skin temperature. The purpose of this study was to explore the difference in thermographic profile of the body in nine students during the course of skiing and to detect changes in skin temperature distributions caused by the fatigue, overuse or injuries. Thermal imaging could be very useful tool in detecting overuse syndrome in sport and preventing sport injuries. Unnatural thermal asymmetry can be the sign of overuse and potential location of injury. In the case of overuse and overtraining the local temperature increase and if detected temperature difference between paired body regions of the left and right side overreach 0.7 °C it can be the sign of some issue that deserves attention (Hildebrandt, Raschner, & Ammer, 2010). The sample consisted nine male students of the Faculty of sport and physical education (age 20±0,68) recruited from the group of students of fourth year of study during the course of skiing. Thermal imaging of the participants was performed by the thermovision camera model E30 (FLIR Systems, Sweden) with thermic sensibility of less than 0,1°C, accuracy ±2% from the registered temperature and photo resolution of 160 × 120 pixels. Obtained thermograms were analysed qualitatively and quantitatively. Thermal images captured before the start of skiing course didn't show any abnormal asymmetry in collateral regions of interest which lead to the conclusion that students didn't have any injury. Furthermore, at the last day of skiing (6th day) course thermal images show small increase in the temperature of the tighs and lower legs, as well as the temperature of lower back.

This increses in temperature can be linked to the greater level of fatigue and DOMS. The physiological requirements of skiing course are high and it can be one of the risk factors for the onset of overtraining syndrome and injury. Also, in two of nine students the asimmentry in temperature were noted and this is in correlation with their perceived pain caused by the fatigue or some kind of injury.

References

Hildebrandt, C., Raschner, C., & Ammer, K. (2010). An overview of recent application of medical infrared thermography in sports medicine in Austria. *Sensors*, 10(5), 4700-4715.

UDK 796.9.613.71

Long-Life Skiing is Related to Functional Capacities in Older Age

Rado Pišot, Armin Paravlić, Saša Pišot
Science and Research Centre, Institute for kinesiology research, Koper, Slovenia

Abstract: Aging represents a multifactorial process associated with several non-irreversible functional and structural alterations of human body, determined by both genetic and environmental factors. Thus, several studies showed that age related functional decline can be reduced by regular physical activity, suggesting that degree of those age related changes my depend of an individual life style (Pišot et al.,2015). Improved body composition along with physical fitness should enable the older individuals to more easily carry out their daily activities, hence enhancing their quality of life. Thus, we aimed to investigate possible differences in functional capacities in older adults' population regarding their life-long physical activity habits, with focus on those who regularly preferred alpine skiing as a type of recreational activity.

Of 449 older adults in total, we intentionally chose 226 subjects (105 males) between 60 and 80 years of age, in which morphometric measures, gait speed, grip strength, balance speed, flexibility and life style questioners were analysed. We divided them in three groups, in a skiers group (N=37) only those who ski regularly on a yearly bases were classified, in inactive group (IG) only those who stated that are not engaged in any kind of planed physical activity and active group (ANS) where we include those who have active life style but have never skied. The data were obtained during mass measurement as a part of international research project PANGeA – Physical Activity and Nutrition for Quality Ageing (2011-2014). Written consent was obtained from each individual prior the onset of the measurements.

: Analysis of variance showed that there were no differences in morphological data between groups in body weight, waist circumference and body mass index, however, groups differ regarding age ($F(2,223) = 3.380$, $p = 0.036$), body height ($F(2,232) = 4.712$, $p = 0.010$) and percent of body fat ($F(2,223) = 5,642$, $p=0.004$). Regarding motor abilities groups significantly differ for gait speed ($F(2,223) = 4,533$, $p = 0.012$) and grip strength ($F(2,223) = 8.023$, $p < 0.001$).

Sub group analysis showed that skiers have for 5% ($p=0.003$) lower body fat percentage compared to IG, while this significance was not observed when ANS was compared with IG ($p=0.65$). Further, skiers have greater gait speed ($p=0.008$), grip strength ($p<0.001$) and aerobic capacity ($p=0.40$) compared to IG, while the same difference were present favouring skiers regarding grip strength ($p=0.009$) and aerobic capacity ($p=0.36$) when compared to ANS.

Significantly better results regarding body fat and functional capacities in habitually physically active older adults are in agreement with literature (DiPietro, 2001). However, compared to individuals who preferred other types of physical activity, we showed favouring results in skiers, suggesting that life-long skiing might preserved functionality in older age to greater extent than other types of activity.

References

DiPietro L. (2001). J Gerontol A Biol Sci Med Sci. 56(suppl 2):13-22.

Pišot R, Paravlić A, Marušič U, Plevnik M, Šporin DZ, Pišot S, Šimunič B. (2015). INTERNATIONAL CONFERENCE ON KINANTHROPOLOGY (p. 348).

SPONSORED BY: