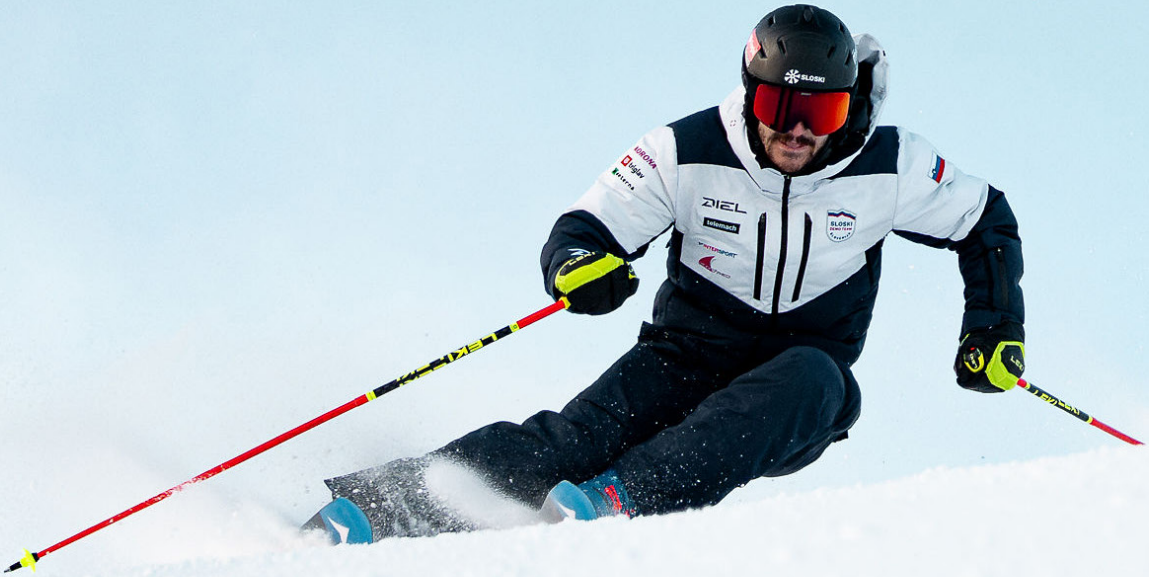
6th Scientific Conference
SPE BALKAN SKI
Science, Practice & Education

THE BOOK OF ABSTRACTS



SPE BALKAN SKI
Science, Practice & Education

8–12 March 2026, Kranjska Gora, Slovenia

6TH SCIENTIFIC CONFERENCE

SPE BALKAN SKI

Science, Practice & Education
(Kranjska Gora, 2026)

The Book of Abstracts

Editors:

Kaja TERAŽ
Saša PIŠOT
Pete ALLISON

KOPER 2026

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6th Scientific Conference SPE BALKAN SKI Science, Practice & Education, Kranjska Gora, 2026

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Abstracts

INVITED SPEAKERS

PROFESSIONS AND PROFESSIONALS IN SNOWSPORTS EDUCATION

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[1]The Pennsylvania State University

[2]International Association of Education and Science in Snowsports

Presenting author: Pete Allison

INTRODUCTION: Within snowsports education, it is common to hear calls for teaching to "become a profession," often motivated by desires for greater legitimacy, recognition, and compensation. However, the term *profession* carries specific meanings that extend beyond status and pay. This presentation critically examines what it means to frame snowsports instruction as a profession and questions whether becoming a profession is achievable and necessarily desirable.

METHODS: Drawing on educational literature concerning professions and semi-professions, this conceptual analysis applies three commonly cited criteria of professions—specialized knowledge, service orientation, and professional autonomy—to the field of snowsports education. The analysis interrogates how these criteria function in established professions and explores their implications when applied to instructional practice in snowsports. Further, I want to contrast this with professionals and what we might think of as professional practice.

RESULTS: The analysis suggests that while snowsports education demonstrates elements of professional knowledge, service and autonomy it is at best a stretch to refer to snowsports educators as members of a profession. Furthermore, aligning too closely with traditional models of professions may introduce constraints, bureaucratic oversight, and rigid credentialing structures that could limit flexibility and innovation. The findings indicate that striving for recognition as a "profession" may not automatically yield the benefits often assumed.

DISCUSSION: Rather than focusing exclusively on achieving professional status, this presentation proposes shifting attention toward cultivating professional practice—emphasizing ethical conduct, reflective practice, and high standards of competence regardless of formal designation. By distinguishing between *professions* and *professionals*, snowsports education can pursue legitimacy and excellence without uncritically adopting the structural and institutional features of traditional professions. This reframing invites a more nuanced conversation about identity, status, and the future of snowsports education.

Keywords: professionals, professions, service, reputation.

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"THE LARGEST SKI SCHOOL IS THE SCHOOL ITSELF" – BENEFITS OF SNOWSPORT TAUGHT AT SCHOOLS AND UNIVERSITIES

Dieter BUBECK[1]

[1]Department of Sport and Exercise, University of Stuttgart, Germany

Presenting author: Dieter Bubeck

INTRODUCTION: Physical inactivity among children and adolescents has become a global public health concern, with the WHO reporting that "more than 80% of the world's children and adolescents were physically inactive" (WHO 2020). In Germany, KiGGS data show a continuous decline in daily physical activity with age. Against this backdrop, this contribution examines the unique value of snowsport as a pedagogical, developmental, and health promoting setting within school and university education.

METHODS: Scoping Review

RESULTS: Drawing on a comprehensive scoping review and a broad evidence base, the study demonstrates that snowsport significantly contributes to the holistic development of young people. Physiologically, it enhances endurance, strength, coordination, metabolic regulation, and neurophysiological adaptation; notably, "2.5 h alpine snowsport = 1 h endurance training" (Stöggl et al. 2016). Psychologically, snowsport improves mood, self competence, flow, body image, and life satisfaction. Social emotionally, extended time in shared winter environments strengthens teamwork, mutual respect, inclusion, and long lasting positive memories.

DISCUSSION: This educational potential aligns with Stefan Kruckenhauser's famous insight that "the largest ski school is the school itself", emphasizing that no institution reaches young people as broadly, equitably, and sustainably as the school system. Snowsport also supports identity development, environmental awareness, and interdisciplinary learning across subjects such as geography, physics, biology, and economics. The findings highlight snowsport as a uniquely motivating, nature based movement context that fosters stronger bodies, more resilient minds, and socially responsible young citizens. To ensure equitable access to these benefits, snowsport should be integrated as a core component of school curricula and embedded systematically in university level physical education teacher training.

Keywords: snowsport at schools, benefits of snowsports, potential of educational system.

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HUMILITY AS A COACHING VIRTUE: A PATHWAY TO EXCELLENCE

Paul GARNER[1]

[1] University of Birmingham, Birmingham, United Kingdom

Presenting author: Paul Garner

INTRODUCTION: This presentation will explore humility as a foundational virtue for person-centred coaching and its role in achieving excellence. Within Alpine ski teaching, relational dynamics and instructor intentionality play a critical role in athlete development. Drawing on Aristotelian virtue ethics and the doctrine of the mean, humility is conceptualised not as weakness, but as a balanced disposition guiding professional judgement and interpersonal conduct towards excellence (Crisp, 2014; Van Zyl, 2018). With frequent ski lift time, Snowsports are uniquely positioned to afford instructors invaluable time for relationship building, providing opportunities to build authentic connections beyond technical instruction. This presentation examines whether sufficient emphasis is placed on these relational spaces and how humility may enhance their developmental impact.

METHODS: The presentation draws upon empirical research conducted in Alpine ski teaching alongside theoretical foundations in virtue ethics and person-centred coaching. Drawing upon a critical realist perspective (Bhaskar, 1975; Elder-Vass, 2010), the research presents the POWA model (Perspective, Other-centredness, Willingness to learn, Accurate self-assessment), developed as a heuristic tool to guide coaches' intentions rather than prescribe specific behaviours (Garner et al., 2022). The model integrates philosophical and applied sport science perspectives to bridge theory and practice.

RESULTS: Findings suggest that humble intentions foster autonomy-supportive learning environments, strengthen coach–athlete relationships, and support sustained athlete development. The POWA framework promotes balanced decision-making and reflective practice, encouraging coaches to navigate interpersonal and performance demands with greater self-awareness and relational sensitivity.

DISCUSSION: Humility offers a practical and philosophically grounded pathway to coaching excellence. By foregrounding intentionality and maintaining person-centred values, instructors can cultivate high-performance characteristics. In the context of snowsports, relational moments, often embedded within routine teaching environments, represent essential opportunities for meaningful development. Practical implications for instructor education will be discussed, including strategies to embed humility within professional development structures. Positioning humility as a strength rather than a limitation reframes excellence as both relational and performance-oriented.

Keywords: coaching, humility, virtue ethics, athlete development, high performance.

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USING QUESTIONS TO ENHANCE LEARNING IN SNOWSPORTS

Andrew HORRELL[1]

[1]The Moray House School of Education and Sport, University of Edinburgh, United Kingdom

Presenting author: Andrew Horrell

INTRODUCTION: In snowsports, a longstanding aim of educators has been to create learning experiences that lead to change, enjoyment, and sustained engagement. Although there is extensive literature outlining the qualities, skills, and pedagogical approaches associated with effective teaching, the relational dimension of learning remains central (Page, 2025). In an age of unprecedented access to information, meaningful moments between educator and learner continue to shape the quality of educational experiences. If attention is the currency of learning, questioning may be understood as a primary mechanism through which engagement and understanding are negotiated.

METHODS: This presentation draws on educational research in curriculum and pedagogy, particularly the literature on questioning strategies, formative assessment, and learner perceptions. It synthesises theoretical perspectives and empirical insights relevant to teacher education and applies them to the specific context of snowsports instruction.

RESULTS: Research indicates that although educators frequently ask questions, concerns persist regarding their frequency, quality, and pedagogical impact. Learners often perceive questions as evaluative tests rather than developmental tools, which may undermine engagement and psychological safety. Evidence suggests that purposeful and well-structured questioning enhances learner participation, supports reflection, and strengthens formative assessment processes.

DISCUSSION: Developing the capacity to ask more effective questions is a key feature of many teacher education programmes. In snowsports, where instruction often occurs in dynamic and relationally rich environments, questioning can be a powerful strategy for making connections, deepening understanding, and enhancing the overall quality of learning experiences. This presentation will explore the core purposes of questioning and discuss practical approaches to integrating high-quality questioning strategies into professional practice within snowsports education.

Keywords: teaching, questioning, evidence, formative assessment, summative assessment.

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PHYSIOLOGICAL ADAPTATIONS TO ALPINE SKIING IN OLDER ADULTS

Vanessa MANN[1]

[1]University of Rostock, Rostock, Germany

Presenting author: Vanessa Mann

INTRODUCTION: The global population aged over 60 is projected to double to 2.1 billion by 2050 (WHO), creating an urgent public health imperative. This demographic shift is characterized by a "Cascade of Decline"—where vascular impairment, muscle atrophy, and cognitive deline accelerate frailty. While summer activities can help to maintain baseline health, older adults face a "Winter Gap"—a seasonal period of sedentary behavior accelerating this cascade. As standart "closed loop" skills, such as walking or stationary cycling fail to provide the mechanical load or cognitive variance to reverse this trajectory, this key note will look at Alpine Skiing as a possible intervention combining eccentric loading, stochastic interval training, and environmental complexity to target all markers of aging simultaneously during a period when the population is most vulnerable to deconditioning.

METHODS: This presentation synthesizes longitudinal data from the Salzburg Alpine Skiing Study (SASS) and biomechanical analyses of the aging athlete. We review the physiological demands of recreational skiing, comparing them against the established criteria for osteogenic and myogenic stimulation. Specifically, we analyze the Quasi-Isometric Eccentric Contractions inherent in the alpine turn and their metabolic cost relative to force production. Conceptually, we apply Gentile's Taxonomy of Motor Skills to contrast the cognitive demands of the ski slope ("Open Loop" environment) against standard "Closed Loop" gym exercises. Note: The target population for these interventions is defined as "active older adults" free from acute orthopedic contraindications.

RESULTS: Empirical findings demonstrate unique biomechanical and physiological adaptations. Biomechanically, the alpine turn generates peak Ground Reaction Forces (GRF) exceeding 2.5 times body weight . Physiologically, this quasi-isometric and eccentric loading triggers a 7.1% increase in muscle size and strength of the main locomotor muscles (quadriceps), successfully attenuating sarcopenic markers. Cardiorespiratorily, the intermittent high-intensity nature of skiing, combined with mild hypoxic stress (altitude), significantly improves VO2max and Cardiac Output. Neurologically, skiing induces spinal reflex plasticity and significantly decreases postural sway. Conceptually, the requirement to navigate variable terrain is interpreted through the lens of sensorimotor integration, suggesting that the "Open Skill" nature of skiing maintains proprioceptive acuity superior to predictable indoor environments.

DISCUSSION: Alpine skiing offers a potent intervention to counteract the winter decline in physical function. It provides high mechanical loading with manageable metabolic cost, enabling older adults to reach strength and cardiovascular thresholds often difficult to achieve in gym settings. Reframed as a prescriptive health strategy, skiing may help flatten the disability curve during the winter gap, though safety, accessibility, and injury prevention must remain central considerations. The discussion challenges the industry and scientific landscape to a) develop age specific frameworks and consider accessibility to different forms of wintersports to the aging demographic and b) conduct further research to confirm and extend positive effects of snowsports and at the same time weigh benefits and risks against

one another. This could include the effects of hypoxia, developing more specific sensomotorical test and the assessment of gait and mobility performance.

Keywords: Cascade of Decline, Winter Gap, Active Aging, Skiing, Open Skill, Cardiovascular Fitness, Sarcopenia.

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BRAIN-CENTERED PERFORMANCE MODELING IN ALPINE SKIING: NEUROSCIENCE MEETS BIOMECHANICS

Uroš MARUŠIČ[1,2]

[1]Science and Research Centre Koper

[2]Alma Mater Europaea University

Presenting author: Uroš Marušič

INTRODUCTION: Alpine skiing performance arises from rapid sensorimotor decision-making under dynamically changing environmental constraints. Traditional biomechanical models describe movement execution but often overlook the neural processes governing prediction, updating, and adaptive control (Marusic et al., 2023). This presentation is based on the recent publication by Boraxbekk, Supej, and Holmberg (2026), which introduces a brain-centred framework for alpine skiing within the concept of Computational Sports Medicine.

METHODS: The framework integrates cognitive neuroscience constructs, particularly working memory updating and prediction-error processing, with biomechanical determinants of ski racing performance. Evidence from neuroscience, sports biomechanics, and applied on-snow monitoring technologies is synthesised into a conceptual performance model linking neural processing efficiency to motor variability, line choice stability, and speed maintenance.

RESULTS: The proposed model suggests that efficient cognitive updating enhances adaptive motor control during high-speed turns, especially under variable snow and course conditions. Increased prediction-error sensitivity may explain performance breakdowns under perturbations. Integrating wearable technologies and advanced kinematic monitoring enables indirect assessment of these neural-behavioural interactions and supports individualised performance profiling (Almqvist et al., 2026).

DISCUSSION: Positioning the brain as the central regulator of alpine skiing performance provides a mechanistic bridge between neuroscience and biomechanics. This perspective expands performance diagnostics beyond mechanical variables and opens new avenues for targeted cognitive-motor training interventions. The brain-centred model offers testable hypotheses for future experimental validation and practical implications for elite athlete monitoring and optimisation.

Keywords: alpine skiing, computational sports medicine, working memory, motor control, performance modelling.

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NATIONAL PROGRAME OF ALPINE SKIING

Sandi MUROVEC[1], Andrej LUKEŽIČ[1]

[1]Ski Association of Slovenia, Slovenia

Presenting author: Sandi Murovec

INTRODUCTION: The National Programme of Alpine Skiing represents the official methodological and developmental framework for children's alpine ski racing in Slovenia (U10–U16). The programme, approved by the Expert Council of the Slovenian Ski Association, aims to standardize coaching practices, unify technical terminology, and provide long-term guidance for athlete development. It addresses the need for a coherent, evidence-informed structure that integrates technical, physical, and organizational components of youth ski racing.

METHODS: The programme was developed through systematic analysis of existing national know-how, international trends in alpine skiing technique, and practical coaching experience. It defines age-specific objectives for each category (U10–U16) and structures training processes at annual, monthly, and weekly levels, distinguishing between on-snow technical training and off-snow physical conditioning. Key components include: (1) standardized definitions of modern alpine skiing techniques; (2) clarification of discipline-specific technical elements and terminology;(3) identification and classification of common technical errors and deviations;(4) determination of expected competence levels at the completion of each age category;(5) specification of foundational physical preparation contents appropriate for biological development; and (6) guidelines for competition planning and athlete monitoring.The programme integrates short-, medium-, and long-term planning principles consistent with long-term athlete development models.

RESULTS: Implementation of the National Programme enables the consolidation of Slovenian professional expertise into a unified operational framework. It improves organizational coherence among clubs, enhances transparency in athlete progression, and optimizes talent identification and competition systems. By clearly defining developmental standards and training content, the programme supports the creation of a broad and sustainable youth base, which is essential for long-term competitive success. Furthermore, standardized planning strengthens strategic alignment at national and club levels, facilitates objective evaluation of performance outcomes, and contributes to rebuilding trust within the local and national skiing community.

DISCUSSION:The establishment of a unified national framework reduces inconsistencies in technical instruction and training methodology across clubs. Particular emphasis is placed on correcting typical technical deviations in youth racing and aligning training processes with developmental stages. Long-term sustainability depends on systematic implementation, continuous evaluation, and cooperation among coaches, clubs, and governing bodies. The National Programme therefore represents a strategic step toward a more transparent, development-oriented, and performance-driven model of children's alpine ski racing in Slovenia.

Keywords: racing, skitechnique, children, training programe.

LITERATURE

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THE METHODICAL APPROACH BY TRAINING TURNING ELEMENTS ACCORDING TO „DIFFERENTIAL LEARNING“

Hannes ROTTENSTEINER[1]

[1]ÖAKS, Federal Sports Academy, University of Vienna, Austria

Presenting author: Hannes Rottensteiner

INTRODUCTION: This methodical approach focuses on the targeted training of turning elements and is grounded in two guiding questions: which skiing skills learners already possess, and which skills are required to achieve the next developmental step. Building on these questions, instructors are encouraged to apply a sound understanding of the Theory of Motion, in order to analyze the qualitative differences between an established turn and a new turn to be learned.

METHODS and RESULTS: In line with Differential Learning theory, the methodology emphasizes the specific acquisition of new movement elements before systematically integrating and refining existing skills. To support this process, a structured framework of exercises is presented, consisting of four progressive blocks: preparation exercises that isolate the new element under simplified conditions; preexercises that combine the *new element* with skills that have already been mastered, again under simplified conditions; training of the target turn in its basic form and movement pattern, and a technical training program aimed at enhancing stability, balance, and specific technical key points.

DISCUSSION: This methodical concept deliberately moves away from learning based solely on repetitive single turns and instead promotes variability, exploration, and adaptability. By broadening the coordinative skill set of learners, reducing inactive time in group settings, and preparing pupils to cope with changing conditions, the approach leads to more diversified, effective, and playful ski instruction, fostering sustainable learning and longterm skill development.

Keywords: methodical approach, differential learning, turning elements in skiing, framework of exercises.

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MAKING PEOPLE SKILLS VISIBLE: FROM SNOWSPORTS EDUCATION TO THE FUTURE OF PROFESSIONAL CREDENTIALS

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[2]IAESS Executive Board

Presenting author: David Schuiling

INTRODUCTION: Historically, the Professional Ski Instructors of America and the American Association of Snowboard Instructors (PSIA-AASI) defined national certification standards around technical performance, teaching proficiency, and professional knowledge of snowsports. While effective, this structure left a critical dimension of professional competence—interpersonal and relational capability—largely implicit and difficult to assess. As workforce research increasingly emphasizes communication, adaptability, emotional intelligence, and leadership as essential competencies, the absence of explicitly defined people-centered skills created a gap in professional credentialing within snowsports education. This presentation argues that formally defining, training, and credentialing People Skills as a distinct domain of professional competence provides a transferable model for developing future-ready credentials aligned with emerging workforce demands.

METHODS: In 2014, PSIA-AASI developed the *Learning Connection* framework, formally identifying People Skills as a distinct and assessable domain alongside Teaching and Technical Skills. First introduced internationally at Interski Ushuaia in 2015, the framework articulated observable behaviors related to trust-building, communication, adaptability, and learner engagement. Using this framework, PSIA-AASI redesigned its national certification standards by embedding clearly defined learning outcomes and measurable assessment criteria. People Skills were operationalized through domains including professionalism and self-management, communication, and relationships with others. A shared national assessment template aligned behavioral indicators with standards to promote reliability, consistency, and transparency across the eight, geographically distributed regions of the association.

RESULTS: Integrating People Skills into national standards transformed evaluation from an implicit, experience-based understanding of professionalism to an outcomes-based credentialing system. Instructors and examiners gained a shared language for describing, developing, and assessing relational competence, strengthening assessment validity and credibility. The framework enhanced professional clarity, reinforced instructor identity, and aligned snowsports credentialing with broader educational and workforce competency models.

DISCUSSION: Making People Skills visible represents more than structural revision; it signals a conceptual shift in how professional excellence is defined and measured. By operationalizing relational competence within credentialing systems, PSIA-AASI offers a replicable case for experiential professions seeking to balance technical expertise with human-centered capability. As professional credentials evolve in response to future workforce demands, the Learning Connection illustrates how making implicit competencies explicit can strengthen assessment rigor, professional identity, and long-term transferability.

Keywords: Learning Connection framework; people skills; relational competence; professional credentialing; competency-based education; transferable skills; certification standards.

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FUELING THE COLD: SNOWSPORT NUTRITION FOR PERFORMANCE & RESILIENCE

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INTRODUCTION: Snowsport present unique physiological and nutritional challenges that differentiate them from other sport disciplines. Cold temperatures and often high altitudes increase metabolic demands and influence substrate utilization, while environmental factors such as dry air and reduced thirst responses complicate fluid balance. In snowsport athletes, increased energy expenditure and accelerated glycogen turnover reflect the need for targeted fueling strategies.

METHODS: This work is based on a synthesis of current literature and consensus guidelines in sports nutrition, with a focus on winter sports environments. Evidence from scientific reviews and position stands was integrated to describe key physiological stressors and practical nutrition strategies relevant for both professional and recreational skiers.

RESULTS: Cold exposure has been shown to elevate resting metabolic rate and increase reliance on carbohydrate metabolism to support both thermogenesis and high-intensity exercise. In snowsport athletes, this is reflected in accelerated glycogen turnover and a heightened need for well-timed carbohydrate intake to maintain blood glucose availability during training and competition. Altitude exposure further amplifies these demands by increasing basal metabolic rate, suppressing appetite, and shifting substrate utilisation toward carbohydrate oxidation, while simultaneously increasing iron requirements for erythropoiesis and oxygen transport. Failure to adequately match energy and nutrient intake to these combined stressors may increase the risk of low energy availability and compromised adaptation. Hydration represents an additional challenge in cold environments. Reduced voluntary fluid intake, increased respiratory water loss in dry air, and cold-induced diuresis may contribute to chronic hypohydration if fluid intake is guided solely by thirst. Structured hydration strategies are therefore required to support thermoregulation, cardiovascular function, and cognitive performance during prolonged ski days.

DISCUSSION: For professional snowsport athletes, effective nutrition strategies should prioritise adequate energy availability, periodised carbohydrate intake aligned with training load, and sufficient daily protein to support muscle repair and adaptation across repeated high-intensity sessions. Travel demands, variable daily workloads, and cold-induced immune stressors further necessitate careful attention to micronutrient status, particularly vitamin D and iron, which are commonly compromised during winter training periods. Recreational skiers experience similar physiological responses to cold and altitude but benefit most from practical and feasible nutrition strategies that emphasise regular meals, planned snacks, and intentional hydration throughout ski days. Translating evidence-based principles into scaled and accessible recommendations can enhance performance, enjoyment, and safety for non-elite skiers. Optimising nutrition in snowsports therefore requires the integration of

environmental physiology with athlete-specific nutrition strategies, supporting both performance outcomes and resilience in cold and alpine conditions.

Keywords: snowsport nutrition, carbohydrate availability, hydration, elite athletes, recreational skiers.

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SCIENTIFIC ABSTRACTS

KINEMATIC TURN ASYMMETRY IN GIANT SLALOM SKIING: A COMPARATIVE CASE STUDY

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INTRODUCTION: Giant slalom (GS) skiing requires highly coordinated and repeatable movement patterns; however, left–right turn asymmetries may persist even in technically proficient skiers. These asymmetries can be influenced by expertise level, long-term technical habits, and movement control strategies, but are often masked by variability in line choice and terrain. By constraining the skiing line within a predefined corridor, external variability is minimized, allowing clearer comparison of turn-direction–dependent kinematics between skiers of different expertise. The aim of this study was to compare left–right turn asymmetry between a ski instructor and an advanced recreational skier during corridor-constrained GS skiing.

METHODS: Two male skiers with different expertise levels (certified ski instructor and advanced recreational skier) performed GS turns through the same predefined corridor on a groomed slope with constant inclination. Full-body kinematics were recorded using the Xsens kinematic system (MVN Link, 240 Hz). Turns were segmented using pelvis yaw rotation, and only complete turns with stable edge engagement were included. Eighteen turns were analysed for the recreational skier and for the instructor. Peak joint angles of the hip, knee, and ankle for inside and outside leg, turn duration, and vertical center-of-mass displacement were calculated and averaged by direction.

RESULTS: Both skiers exhibited left–right asymmetries across multiple kinematic variables; however, their magnitude and structure differed. In the advanced recreational skier, outside-leg hip abduction was notably greater in left compared with right turns (21.0° vs 14.0°), indicating different strategies of lateral angulation and edge control. This was accompanied by larger knee flexion angles in both the outside (74.5° vs 56.9°) and inside leg (83.5° vs 69.0°), suggesting increased joint involvement in load absorption and pressure modulation. Inside-leg ankle dorsiflexion also differed markedly between left and right turns (25.0° vs 19.4°). In contrast, the ski instructor demonstrated considerably smaller left–right differences, with outside-leg hip abduction asymmetry below 3° and knee flexion differences below 5° for both legs, indicating more symmetrical joint-level control. For both skiers, turn duration (recreational: 1.63–1.79 s; instructor: 1.68–1.74 s) and vertical CoM displacement (recreational: 0.035–0.037 m; instructor: 0.034–0.036 m) showed only minor directional differences, indicating that the observed asymmetries were not driven by global movement timing or vertical oscillation but rather by joint-level control strategies.

CONCLUSIONS: This comparative case study shows that turn-direction asymmetries can be detected in GS skiing even when external variability is minimized. Expertise level influenced the magnitude and structure of these asymmetries, with the ski instructor exhibiting more symmetrical joint-level kinematics, while the advanced recreational skier relied on direction-specific movement strategies. Wearable IMU-based kinematic analysis combined with

a corridor protocol provides a practical tool for identifying technique-related asymmetries and supporting targeted coaching and instructor education in alpine skiing.

Keywords: Xsens kinematic system, joint kinematics, movement symmetry, technique analysis.

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BALANCING LIFE AND CAREER IN FEMALE ALPINE SKI COACHING

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INTRODUCTION: Women coaches in Alpine skiing remain underrepresented. Compared to men, data show that women have a higher dropout rate when pursuing careers as Alpine ski coaches. This disparity raises an important research question: what factors contribute to women's withdrawal from coaching careers in Alpine skiing? The European ERASMUS+ project Empowering Women in Alpine Skiing (EWAS), coordinated by the University of Rome Tor Vergata, Italy, in collaboration with ZRS Koper, Slovenia, and several European skiing or-ganisations, investigated these factors to support women in coaching and leadership roles and to foster greater inclusivity in Alpine skiing. The findings of the survey highlighted per-sistent gender inequalities, including lower pay for equivalent work and the prevalence of a male-oriented coaching environment. Although the survey explored several factors related to dropout, this study concentrates on the role of work–life balance in shaping female coaches' career decisions.

METHODS: Data were collected using an online questionnaire administered via the 1KA ac-ademic platform. The data collection period lasted four months, during which 240 female coaches from an international context completed the survey. The questionnaire consisted of 28 items, including both closed and open-ended questions (5-point Likert scale). Closed-ended questions enabled quantifiable assessment of factors potentially contributing to dropout. Open-ended questions were included to capture personal perspectives and rea-sons, providing a more descriptive account of the work-life balance dimension and allow-ing participants to elaborate on experiences not fully represented by predefined response options.

RESULTS: As expected, the results showed that within the work-life balance dimension, two aspects were particularly important: "Too little time with family and friends" (m = 2.5) and "Increase in the amount of time required for coaching" (m = 2.2). These findings indicate that the work-life balance dimension plays an important role in female coaches' career decisions. Open-ended responses further illustrated personal perspectives and reasons descriptively. Respondents identified several important aspects contributing to dropout, including lack of health insurance or inability to afford it, difficulties in aligning ski coaching schedules with other jobs, and challenges related to pregnancy, child-rearing, caring for elderly parents, and family planning.

DISCUSSION: These findings highlight the crucial role of work-life balance in career decisions among female coaches. They suggest that coaching standards, policies, and organisational practices should be adapted to create a more inclusive environment that accommodates personal and family responsibilities, such as adaptive scheduling and support for career-re-lated expenses. Furthermore, future research should include coaches of all

genders to exam-ine potential gender-specific and gendered differences in factors affecting career retention, structural opportunities, and barriers. Such an approach would support the development of equitable, gender-responsive practices and inform targeted interventions and policy adjust-ments that promote career continuity, equity, and inclusivity across Alpine skiing coaching roles.

Keywords: Alpine Skiing, coaching career, gender equality, work-life balance.

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LUPENI MOUNTAIN RESCUE BETWEEN HISTORY AND OPERATIONAL PRACTICE

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INTRODUCTION: The growth of mountain tourism and the diversification of recreational activities in Romania have put increasing pressure on mountain rescue services, highlighting the need for institutional and operational analysis of intervention capacity. The activity of the Lupeni Mountain Rescue Public Service highlights the central role of the team in ensuring the safety of tourists in the Straja–Vâlcan area, the largest area in the Retezat Mountains, and the press articles capture the evolution of the service from its early structures in the 1980s to its current level of perfection. These historical landmarks complement the recent operational analysis and provide a coherent picture of the continuity and consolidation of the Lupeni Mountain Rescue Service in the context of the development of mountain tourism in the Jiu Valley and the Straja-Lupeni ski area.

METHODS: The study examines the evolution of the Mountain Rescue Public Service, with a focus on the activity of the Lupeni Mountain Rescue Public Service, using both recent statistical data (2017–2024) and documentary sources from the press at the time of its establishment (Arcanum Online Archive: Jurnalul Național, România Liberă, România Pitorească, Agenda Zilei) to reconstruct the initial stages of the service's development.

RESULTS: The analysis highlights a consistent seasonal distribution of interventions, with a clear predominance in the winter season (over 60% annually), a peak in cases in 2019, and a stable proportion of serious medical emergencies (29–36%). Air transport, although low in volume, is on the rise, reflecting both the difficulty of access to the terrain and the modernization of rescue logistics. The case study dedicated to Salvamont Lupeni (2015–2025) reveals intense activity in a high-risk mountain area, characterized by difficult terrain, variable weather conditions, and increased tourist flow. The case study includes accidents on the slopes, people getting lost, injuries, and situations caused by inadequate equipment, all of which were efficiently managed by the local team.

DISCUSSION: The results highlight the need to strengthen investment in training, equipment, and preventive measures, as well as the importance of implementing a culture of safety among tourists. Improving response capacity and reducing mountain risks depend on an integrated approach that is institutionally supported and adapted to Romania's current geographical specificities.

Keywords: mountain rescue, Retezat Mountain, evolution, history.

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THE WHOLE MOUNTAIN: A HOLISTIC UNDERSTANDING OF RETENTION AMONG SKILLED SEASONAL PROFESSIONALS

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INTRODUCTION: Traditional retention theories, developed for permanent organisational employment, prove inadequate for understanding retention in seasonal professional work. This research examines retention among skilled seasonal tourism professionals through a case study of ski instructors, proposing a holistic four-dimensional framework for understanding careers that span multiple employers, geographic locations, and temporal cycles while maintaining professional identity and commitment.

METHODS: The research employed a qualitative case study approach with two interview datasets. The first comprised 16 semi-structured interviews with ski instructors from ten countries, with experience spanning 4 to 49 seasons across thirteen countries, collected between 2018 and 2022. The second dataset consisted of 11 interviews conducted in spring 2021 focusing on pandemic experiences. Data were analysed through abductive thematic content analysis and composite narrative methodology, examining retention factors, work motivations, and crisis resilience from workers' perspectives.

FINDINGS: Ski instructors constitute highly qualified professionals who invest substantially in certifications and maintain strong professional identities. Retention operates simultaneously across four interdependent dimensions: organisational retention, professional retention, temporal retention, and social retention. Psychological capital functions as a cross-cutting resource enabling navigation across all dimensions. Intrinsic motivations—particularly meaningful work integrating passion, teaching, and continuous skill development—sustain long-term career commitment despite employment discontinuity, geographic mobility requirements, and modest compensation. During COVID-19, professional identity and transnational occupational communities proved more critical for career persistence than organisational relationships.

DISCUSSION: This research demonstrates that retention in skilled seasonal professional work requires moving beyond organisation-bound frameworks to recognise the complex interplay between career continuation, employer selection, cyclical employment management, and community connection maintenance. The findings advance theoretical understanding of non-traditional career patterns and provide practical insights for supporting sustainable careers in seasonal professional work, with implications extending to increasingly mobile and disrupted professional contexts beyond tourism.

Keywords: skilled seasonal work, employee retention, professional identity, meaningful work, tourism employment.

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THE INFLUENCE OF MOTION GUIDANCE AND THE SKI BOOT CANTING ON SINGLE-LEG BALANCE IN YOUNG RECREATIONAL SKIERS

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INTRODUCTION: The constraints model of motor skills acquisition states that motor skills arise from the interaction of three primary constraints which could be any task, environmental, or individual-related factor that shapes or influences the outcome of movement or motor pattern that is observed. Task constraints include the goals, rules, and equipment that are used to perform a motor skills. The aim of this study was to investigate how independent variables, which were the one leg stability tasks with and without external focused motion guidance and ski boots canting, influence the depending variable which was the time for maintenance of one leg stability in all measured conditions for a maximum period of 30 seconds among a group of young recreational skiers in laboratory settings.

METHODS: Fourteen young male recreational skiers (average 15.04 ± 0.97 SD years old) completed single leg stance by balancing for a maximum period of 30 seconds, respectively on their right and left foot on a "Special constructed balance plate" in three different conditions: on standard ski boot (NORMAL), ski boots with 2° canting wedge high on the lateral side (VALGUS). and ski boots with 2° canting wedge high on the medial side (VARUS), and respectively the all tested conditions with external focused motion guidance of projection of their body centre of gravity on the frontal plate distanced 3 metre in front of them using laser pointer set on their waist at the umbilicus position. The plate for balancing was made especially for this purpose using manufactured foot platform, bindings system and aluminium frame from SKIROAD skates (model turn around), modified with prolonged two wheels aluminium chassis (model Micro Scooter carving wheel 80mm 2020). The canting modifications were applied under the ski boot using strips of wedged plastic taped to the plate. The task for all participants was to remain required balance positions for a maximum period of 30 seconds. The best of three individual trail in all conditions was taken for evaluation. Friedman ANOVA and Kendall's Coefficient of Concordance (W) were used for the determination of statistical differences between all tasks and the concordance of performance levels of subjects across all tasks, respectively.

RESULTS: Analyses showed statistically significant differences in the ability of one leg balancing among all tasks: ($\chi 2 = 35.488$; $p < 0.001$), and spectrum from low to high concordance among performers. The higher concordance is defined between task one leg balancing on non-kicking leg in Varus position with and without external focused motion guidance (W=.824**; $p < 0.001$). Respectively the lower concordance is defined between tasks one leg balancing in Normal and Valgus position on dominant kicking leg without external focused motion guidance. (W=.077; p=.702). The results from cross-differences tests shows statistically significantly better performance in Varus position one leg balancing tasks in relation to the same tasks performed with external focused motion guidance, both with dominant kicking leg (Z=-2.982; p=.003) and non-dominant kicking leg (Z=-3.296; p=.001)

DISCUSSION: Those findings suggests that motion guidance external focus has general negative influence of balance performances in young recreational skiers, with most significantly differences in one leg balancing Varus position on both dominant and non-dominant legs. In summary, it could be concluded that the applied canting constraints and applied external focused motion guidance has specific influence on one leg balancing ability among recreational young skiers in laboratory settings.

Keywords: skiing, constraints, motion guidance, boot canting, balance.

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EMPOWERING WOMEN IN ALPINE SKIING: CHALLENGES AND OPPORTUNITIES IN COACHING CAREERS

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INTRODUCTION: In Europe, women are more often represented in coaching and leadership roles in youth, recreational, or "women's" sports. However, they remain underrepresented at elite levels, as seen in alpine skiing: Austria has 25.5% women coaches overall but only 17% in elite teams, while in Slovenia just 12% of licensed alpine skiing coaches are women.

METHODS: This study draws on findings from the European ERASMUS+ project EWAS – Empowering Women in Alpine Skiing, coordinated by the University of Tor Vergata (Rome, Italy) in collaboration with ZRS Koper (Slovenia) and skiing organizations from Italy, Ireland, Denmark, Belgium, and Finland. The project combined qualitative problem research with practical interventions aimed at improving training programs, enhancing the visibility of female role models, and facilitating more accessible pathways to coaching and leadership positions. The empirical component comprised an online survey, "EWAS – Women in Alpine Skiing Coaching", administered via the 1KA academic platform in English. The on-line survey included 28 questions covering 101 variables and was open for three months, from April 23 to July 23, 2024. A total of 240 female coaches from international scope completed the survey, yielding valid responses for analysis.

RESULTS: The results presented both the primary motivations for entering the coaching profession and the key factors contributing to career drop out among female alpine skiing coaches. Respondents rated the importance of various factors using a 5-point Likert scale (1 = not important, 5 = most important). Intrinsic motivations predominated, with participants reporting a desire to serve as role models (M=3,2), support athlete development, and derive personal satisfaction from their work (M=3,0), whereas extrinsic factors, such as prestige or financial incentives were comparatively less influential. Conversely, the analysis identified several key contributing to women leaving the profession. These are primarily structural and systemic, included insufficient financial support (M=2.7), challenges in reconciling professional and private life (M=2.5), gender pay gaps, precarious working conditions, and discriminatory practices including sexism and limited career advancement opportunities (M=2.3). Additionally, the physical demands inherent to alpine skiing coaching were reported as contributing to career discontinuation.

DISCUSSION: The EWAS project integrated empirical research with practical interventions, including workshops on ski and boot preparation, safety, sport conditioning, and sports nutrition. These activities demonstrate that the sustainable inclusion of women in coaching requires the systematic addressing of gender biases, the improvement of working conditions, and equal opportunities for career development and remuneration, and the increased visibility of female role models. Targeted national and international initiatives, such as EWAS project, can contribute to the creation of a more inclusive and supportive professional

environment, thereby enhancing retention, facilitating professional development, and promoting the overall effectiveness and improved representation of female coaches in alpine skiing.

Keywords: alpine skiing, female coaches, gender equity, career development, educational programs.

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RELATIONSHIP OF VARIABLES OF THE IRONMAN TEST BATTERY WITH THE PERFORMANCE OF ALPINE SKIERS IN FIS COMPETITIONS

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INTRODUCTION: In this research we determined the correlation between the results of the Ironman test battery and the competitive performance of Slovenian female alpine skiers. The Ironman test battery is used to assess aerobic and anaerobic endurance, strength, agility and coordination, and speed. Research shows that it is an effective indicator of the achievement of physical capacity of competitors for success in alpine skiing. Success in alpine skiing is evaluated by the total number of points achieved in International Ski Federation (FIS) competitions at the end of the current ski season.

METHODS: In this research all Slovenian female alpine ski competitors who competed in FIS competitions in the 2018/2019 season were included in the study. The subjects were divided into three age groups. In the first group we have (1/15-17 (12)) in the second (2/18+(5)) and in the third (3/all (17)). The correlation between individual variables of the Ironman test battery and performance in FIS competitions was determined by calculating the Pears' correlation coefficient. The correlation between the state of physical capacity, or the final assessment of the state of the entire set of Ironman variables, and performance in competitions was determined by multiple regression analysis.

RESULTS: This research has confirmed especially by the key finding of our work, that we have proven statistically significant connections between individual movement variables (HEX and VZDKT) and the entire set of Ironman battery variables (IRON) in the group of measured women aged 15 to 17 (1/15-17), as well as in the group of the entire sample (3/all). On the other hand, the results of the Ironman tests in the 2nd group 18+ (5) did not show statistically significant associations with the results at FIS competitions. The primary reason is the small number of measured girls as well as possible deficiencies in physical preparation. Finally, research has brought us much closer to answering questions about the effectiveness and usefulness of the Ironman test battery, which is used by all major skiing countries to monitor the success of their competitors.

DISCUSSION: Based on the findings, we can conclude that the Ironman test battery is a potentially effective indicator of the level of physical performance for achieving competitive performance in alpine skiing.

Keywords: Ironman test battery, performance in alpine skiing, FIS competitions, development of motor skills in alpine skiing.

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WAS SARS-COV-2 CIRCULATING UNDETECTED? A CLUSTER OF SEVERE INFLUENZA-LIKE ILLNESS DURING A UNIVERSITY SKI COURSE IN JANUARY 2020

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INTRODUCTION: University-based snow sport education courses involve intensive physical activity, shared accommodation, and international mobility, conditions that facilitate the transmission of respiratory infections. The Faculty of Kinesiology has conducted multiple 10-day ski courses annually in Sappada, Italy, since 1995. During a course held in January 2020, before the recognition of sustained community transmission of COVID-19 in Europe, an unusually high incidence of influenza-like illness (ILI) with increased clinical severity was observed.

METHODS: We performed a retrospective analysis of clinical observations and medical records documented by the attending physician during a university ski course conducted in Sappada, Italy, from 23 January to 2 February 2020. The cohort consisted of 54 students (31 Croatian, 1 Italian, 9 Spanish, and 13 Chinese). In the 1–2 weeks preceding the course, several participants had traveled to their home countries or had family visits from China. Incidence of illness, symptom profile, duration of functional impairment (lost ski days), and clinical findings were evaluated and compared with data from comparable courses conducted in preceding and subsequent years.

RESULTS: Eighteen of 54 participants (33%) developed acute illness, markedly exceeding the typical incidence of 2–4 (5 to 19%) cases per course observed in years before 2020 and after 2022 . For comparison, four cases were recorded in 2019, two mild upper respiratory infections in 2026, and a mean of 2.5 cases per course in seasons 2023–2024 ($Chi2=13.18$; $p<0.001$). Illness onset followed a sequential pattern, initially affecting the Spanish subgroup, followed by individual case among Chinese students and subsequent spread among Croatian students. Clinical manifestations included high fever, persistent cough, and pronounced fatigue, with recovery requiring 4–7 days of missed skiing activity. Additional features included severe headache (n=3), severe sinusitis requiring later hospital treatment (n=1), and delayed-onset diarrhea (n=4). Although olfactory disturbances were not documented, rhinorrhea was commonly reported. In several cases, increased respiratory effort and auscultatory findings suggestive of lower respiratory tract involvement were noted—features uncommon in comparable courses before 2020 and after 2022, where recovery typically occurred within 1–2 days.

DISCUSSION: At the time of the course, only isolated travel-associated COVID-19 cases had been reported in Europe, and community transmission had not yet been officially recognized in Croatia (first case 25th February), Italy (20th February), or Spain (31st January). Although virological confirmation was unavailable, the unusually high proportion of symptomatic cases, increased symptom severity, prolonged recovery, and respiratory findings raise the possibility of early, undetected circulation of SARS-CoV-2. These observations highlight the

vulnerability of group educational settings to rapid respiratory pathogen transmission and support further investigation of pre-pandemic respiratory illness clusters.

Keywords: influenza-like illness, SARS-COV-2, respiratory symptoms, international students, snow sport education.

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A NEW ERA OF SKIING: THE CULTURAL FACTORS BEHIND THE TECHNICAL REVOLUTION

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INTRODUCTION: What determines the transformation of a sport? On the one hand, the evolution of the athlete, whether physical, technical or psychological; on the other, the context in which the sport is practised, such as the playing fields or the equipment. However, this second strand includes aspects that we could define as 'historical' because involves the economic, social and cultural dimensions of sport. A case study particularly rich in examples concerns the history of skiing.

METHODS: This study employed various historical methodologies. A critical comparison of the main historiographical sources in English, Italian and Slovenian was carried out, focusing on the rapid expansion of skiing in Europe and globally between the 19th century and the second half of the 20th century, when its use as a means of transport declined and it became established as a sporting and tourist activity. Oral history was employed as well, with the collection, transcription and critical analysis of 6 oral testimonies, born in the 1960s and active as ski instructors between the 1980s and early 2000s in the Italian Alps. The topics emerged from the oral sources, collected between the 2022 and 2025, were then put in comparison with the written ones, like newspapers articles, federation rules, bulletins, regional laws, etc.

RESULTS: A great transformation profoundly reshaped the world of skiing between the 1980s and early 2000s. All the investigated sources highlight how much the ski-industry was influenced by the emergence and rapid rise of three particular variants of skiing, some even becoming established winter sports disciplines. The phenomenon seems to have been widely extended in the Western European and American ski system. Snowboarding and free-skiing had a bottom-up direction, being invented and empowered by the young American so called 'counter-cultures', like punk and hip-hop, firstly rejected ant later embraced by the ski resorts. On the other hand, the explosion of carving skiing had a top-down path, developed in Europe for the top-level athletes, than extended to the whole population of skiers worldwide.

DISCUSSION: The historical trajectory of skiing traced in this study, aims to open up a new area of research for sports history and social sciences on a segment that is often ignored by these disciplines. The data emerging from sources, whether written, oral or otherwise, show that the world of skiing, although significant from an economic and sporting point of view, is virtually unknown in its cultural dimension. The academic existing literature on the history of skiing is rather scarce and concerns mostly the archaic origins of skiing, technical developments and the biographies of great champions. In essence, there is a lack of studies dedicated to skiing in its complexity, relating its economic and industrial dimensions to its cultural and social aspects. A contemporary history of the ski-system may represent an interesting perspective for future studies in this field

Keywords: ski history, snowboard, carving, free-skiing, ski instructors.

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KINEMATIC SYMMETRY OF PARALLEL SKI TURNS AMONG CERTIFIED SKI INSTRUCTORS

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INTRODUCTION: The parallel turn is a fundamental and widely used element of alpine skiing, applied across all skill levels. It requires precise motor control, spatial orientation, and postural stability. Although symmetry is often expected among skilled skiers, small differences in execution between left and right turns are not uncommon. Kinematic analysis can help identify asymmetries that may impact technique, efficiency, or injury risk. This study focused on the second phase of the turn, defined as the moment of passing through the fall line when the skis are parallel to it. This phase involves high lateral loading, maximal edge angle, and the greatest distance between the feet and the center of mass. The aim was to examine whether certified ski instructors show kinematic differences between left and right turns during this key phase. Understanding movement precision and symmetry in expert skiers may inform better teaching strategies for young athletes. As physical activity is essential for youth development, identifying patterns that support safe and effective learning promotes health, motivation, and inclusion through sport.

METHODS: Twenty-three certified alpine ski instructors (31.4 ± 4.6 years) performed parallel turns on a moderately steep slope, within a 20-meter corridor under consistent conditions.. Kinematic data were collected using the Xsens MVN Link inertial motion capture system. Each participant performed 10 left and 10 right turns, and the second phase of each turn was selected for analysis. The following kinematic variables were analyzed for both inside and outside leg: knee flexion angle, hip flexion angle, and hip abduction. A multivariate comparison of left and right turns was conducted using Hotelling's T^2 test ($p < 0.05$).

RESULTS: The multivariate analysis revealed no statistically significant difference between the left and right turns (Hotelling's $T^2 = 0.07$; $F = 0.48$; $p = 0.82$). All kinematic parameters showed a high level of similarity between turn directions, with mean values and standard deviations differing only slightly. None of the individual variables showed statistically significant differences when compared separately. A review of individual participant data confirmed consistent joint movement patterns in both turn directions, with no clear tendency toward either the left or right turn.

DISCUSSION: The results indicate that certified ski instructors perform left and right parallel turns with a high level of kinematic consistency during the most demanding phase. Their automated and symmetrical technique highlights the importance of movement control in expert performance. In contrast, recreational and novice skiers often demonstrate asymmetries that may hinder progression and increase injury risk. The findings support the role of instructors in promoting balanced, safe technical development in youth skiers. In this context, biomechanical insights can help prevent injuries and provide practical guidelines for teaching alpine skiing as a winter activity that supports youth physical development.

Keywords: alpine skiing, kinematic analysis, ski turn symmetry, ski technique.

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VASTUS LATERALIS CONTRACTILE PROPERTIES AND PHYSICAL PERFORMANCE IN YOUTH ALPINE SKIERS ACCORDING TO MATURITY STATUS

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INTRODUCTION: Very little is known about the influence of biological development on muscle contractile properties and their relationship with the physical performance of alpine skiers in younger age categories. The purpose of the study was to examine the effects of biological maturation on the contractile properties of the vastus lateralis (VL) muscle using the method of tensiomyography (TMG), as well as their relationship with countermovement jump (CMJ) height and maximal 20-meter flying sprint speed (20 m L), and to provide normative values for this population.

METHODS: The study included 139 alpine skiing competitors in younger categories, aged between 10 and 16 years. The maturity status of the participants was determined based on the calculation of maturity offset (MO) and the predicted age at peak height velocity (PHV). Based on this, the participants were divided into three groups according to PHV timing: pre-PHV (23), mid-PHV (81), and post-PHV (35). Using the TMG method, we measured contraction time (Tc) and, based on other TMG parameters (Dm, Td, and Ts), calculated velocity of contraction (Vc). CMJ height was measured using a tensiometric platform, and 20 m flying speed was assessed using an electronic measuring device with photocells.

RESULTS: One-way analysis of variance showed no statistically significant differences in the TMG variables Tc and Vc between individual PHV periods; however, significant differences were found for CMJ height ($p = 0,002$) and 20 m flying speed ($p < 0,001$). For the latter two variables, an independent samples t-test revealed that individuals in the post-PHV group achieved better values compared to the pre-PHV and mid-PHV groups ($p < 0,05$). Correlation analysis did not show statistically significant associations between biological age and Tc or Vc. Furthermore, a positive correlation was found between Vc and CMJ height ($p = 0,03$; $r = 0,16$) as well as 20 m flying speed ($p = 0,02$; $r = 0,18$).

DISCUSSION: The presented results contribute to a better understanding of the effects of biological maturation on muscle contractile properties and physical performance during the critical period of growth. While CMJ height and 20 m flying speed increased with maturation, VL contractile properties (Tc and Vc) remained stable. This stability may reflect early maturation of muscle contractile function, which reaches near-adult values before the adolescent growth spurt, and individual variability in fiber composition, neuromuscular efficiency, and training history. No significant associations were found between biological age and Tc or Vc, suggesting that TMG parameters are influenced more by intrinsic muscle characteristics and specific training adaptations than by maturation alone. Importantly, higher Vc was positively associated with both CMJ height and sprinting speed, highlighting its relevance for explosive and coordination-demanding movements. These findings can guide coaches

in diagnostics and training optimization, while longitudinal studies are warranted to explore developmental changes further.

Keywords: alpine skiing, biological maturation, tensiomyography, countermovement jump height, sprinting speed.

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THE ROLE OF PARA-ALPINE SKIING IN THE RESOCIALIZATION OF ATHLETES WITH ACQUIRED DISABILITIES

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INTRODUCTION: Acquired physical disability represents a major life disruption that affects physical functioning, psychological well-being, social relationships, and personal identity. Previous research highlights sport as an important factor in rehabilitation; however, less is known about its broader role in resocialization and identity reconstruction among elite athletes with disabilities. Para-alpine skiing, as a highly demanding competitive sport, provides a unique context for examining how elite sport participation contributes to life satisfaction, self-concept, and social reintegration following traumatic injury.

METHODS: A qualitative research design was employed using semi-structured interviews with six elite para-alpine skiers (four men and two women) who participated in the Paralympic Winter Games Sochi 2014. Participants originated from Europe and North America and had acquired their disabilities through injury. Interviews focused on life satisfaction, self-image, social and athletic identity, rehabilitation, resocialization, accessibility of sport infrastructure, and financial support. Data were transcribed verbatim and analyzed using qualitative content analysis following grounded theory principles, including open, selective, and relational coding. A paradigmatic model was constructed to explain the mechanisms through which sport influences resocialization.

RESULTS: Findings indicate that elite para-alpine skiing plays a significant and multidimensional role in resocialization. Participation in high-performance sport contributed to increased life satisfaction, strengthened self-esteem, and the reconstruction of both social and athletic identity. Athletes reported improved autonomy, physical competence, and psychological resilience as key turning points in their post-injury lives. Strong family relationships and newly formed social networks within sport teams emerged as central supportive factors. Accessibility of sports infrastructure was generally adequate, while financial constraints prior to national team inclusion represented a major barrier to sustained participation.

DISCUSSION: Elite para-alpine skiing functions as a holistic resocialization mechanism that extends beyond physical rehabilitation. Through structured training, competition, and social interaction, sport enables athletes with acquired disabilities to regain a sense of normality, purpose, and social belonging. The developed paradigmatic model highlights the interaction between personal, social, and structural factors, emphasizing the importance of financial and institutional support for long-term inclusion in elite disability sport.

Keywords: para-alpine skiing, resocialization, acquired disability, athletic identity, qualitative research.

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DYNAMICS AND FREQUENCY OF INCIDENTS IN THE PRACTICE OF SNOW SPORTS IN PAMPOROVO RESORT-BULGARIA FOR SEASONS 2023–2025

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INTRODUCTION: Skiing is among the most popular winter sports, but is known for an increased risk of traumatic incidents, especially during intense seasonal activity. The Pamporovo resort complex, located in the Rhodope Mountains, is one of the leading ski resorts in Bulgaria and is distinguished by a variety of slopes with varying degrees of difficulty and application during the active season. The most frequently reported injuries in snow sports affect the lower extremities, knee joint and soft tissues, with their frequency being related to the training equipment, the conditions of the slopes and the intensity of the users' activity in the area. The analysis of the frequency and dynamics of injuries is essential for planning effective preventive measures in ski resorts. The aim of the study is to analyze the dynamics and frequency of traumatic incidents in ski sports in the Pamporovo resort complex over a three-year period and to assess their relationship with seasonal ski activity.

METHODS: The study was conducted as a retrospective descriptive and correlational analysis of aggregated seasonal data on traumatic incidents in snow sports in the Pamporovo resort complex over a period of three consecutive seasons. The number of registered incidents by season, the number of active ski days and the number of unique ski visits per day (unique daily users) registered through an electronic lift access system for each season as indicators of ski activity and exposure, including seasonal, daily and three-day maps (data from the concessionaire of the Pamporovo area AD) were analyzed. Descriptive statistics were used to show the number and frequency of incidents, with the frequency of trauma standardized towards the exposure indicators. The dynamics of the indicators were analyzed over time, and the relationship between traumatic incidents and seasonal ski activity was assessed through correlation analysis.

RESULTS: For the period 2023–2025, an increase in both active ski days and the number of unique ski visits per day in the Pamporovo resort complex was established. In parallel, an increase in the absolute number of traumatic incidents is reported from 275 in 2023 to 414 in 2025. After standardizing the frequency of the direction of registered ski visits, the frequency of incidents amounts to approximately 10.0, 12.1 and 11.4 per 10,000 visits for 2023, 2024 and 2025, respectively. The analysis of the dynamics shows that the increase in incidents follows the general trend of increasing ski activity, with no linear increase in the standardized frequency. A positive relationship is observed between the number of incidents and indicators of seasonal ski activity.

DISCUSSION: The results obtained emphasize the importance of systematic monitoring of injuries in ski sports and the need to adapt preventive measures to the load and seasonal dynamics. The observed increase in the absolute number of incidents at the end of the study period follows the general trend of increasing skiing activity, measured by the number of active skiing days and registered unique visits. At this time, the absence of a linear increase in

the standardized incident frequency suggests that the increased injury rate is more a result of increased exposure than of increased individual risk for the individual skier. These results highlight the need for adaptive prevention strategies targeting periods of increased load, as well as using standardized indicators for risk assessment and planning of safety measures in ski resorts. In this context, the results obtained show that the assessment of injury in snow sports should be based not only on the absolute number of incidents, but also on standardized indicators that take into account the real exposure and seasonal intensity of skiing activity, which is essential for planning effective and targeted prevention measures in ski resorts.

Keywords: snow sports, ski accidents, trauma, winter tourism, seasonal activity.

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ACCELEROMETRIC MONITORING OF PHYSICAL ACTIVITY IN PHYSIOTHERAPY STUDENTS DURING A 'SNOW SPORTS' COURSE AT THE NATIONAL SPORTS ACADEMY 'VASIL LEVSKI': EFFECTIVENESS OF SHORT-TERM MOTOR INTERVENTIONS

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INTRODUCTION: Assessing physical activity in outdoor sports poses methodological challenges, particularly when relying on self-reported methods, while inertial measurement units offer objective, real-time analysis. Sedentary behavior among students is an emerging public health concern. This study aims to examine the physical activity of physiotherapy students during a snow sports course using accelerometric monitoring and to evaluate its effectiveness as a short-term motor intervention. The research provides new insights into the role of educational programs in promoting active lifestyles among young adults.

METHODS: A total of 81 students (41 women and 40 men) participated in a week-long practical course on "Snow Sports" during which they wore AX3 triaxial inertial devices (Axivity, UK, measuring acceleration up to ±16 G at 3200MHz) mounted on the wrist of the non-dominant hand. Physical activity was categorized into four intensity levels—inactive, low, moderate, and high—based on metabolic equivalents. Sleep time was excluded from the analysis, resulting in a fixed net active monitoring window of 6,503 minutes per participant, calculated based on the study protocol. A key component of the study was the data set from the alpine skiing practice sessions.

RESULTS: Weekly average activity distribution (total of 6502 minutes): Inactivity: 4132 min (64%), Low activity: 791 min (12%), Moderate activity: 1559 min (24%), High activity: 20 min (0.31%). Daily average activity distribution (total of 929 minutes): Inactivity – 590 min (61%), Low activity – 113 min (12%), Moderate activity – 223 min (23%), High activity – 3 min (1%). During the practical sessions (total of 2093 minutes): Inactivity – 1067 min (51%), Low activity – 301 min (14%), Moderate activity – 715 min (34%), High activity – only 10 min (<1%). Roughly one-third of total physical activity occurred during training hours, which accounted for 50 percent of all high-intensity movement. No statistically significant associations were observed between body mass index (BMI) and inactivity ($r = 0.15$, $p = 0.181$), or between BMI and moderate physical activity ($r = -0.20$, $p = 0.073$); however, both relationships showed weak directional trends. Although these findings did not reach statistical significance, they indicate weak directional patterns between moderate physical activity and BMI.

DISCUSSION: The winter sports course provided significant motor engagement with a predominantly moderate intensity, with the overall duration and effort supporting its value in promoting physical activity. Correlations with BMI suggest that moderate activity may offer health benefits to students. These findings highlight the course's potential as a short-term, structured physical intervention supporting cardiovascular and metabolic health. Uniquely, this study used accelerometry to objectively quantify activity during beginner-level winter sports in a formal educational setting—an area previously understudied. The data reveals

the physical demands in a dynamic environment and highlights the course's role as an educational and health tool.

Keywords: physical activity, inertial measurement, snow sports, ski training, university students, body mass index.

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FUNCTIONAL RELATIONSHIP BETWEEN STANCE PREFERENCE (REGULAR/GOOFY) AND LOWER-LIMB STRENGTH IN SNOWBOARDING

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INTRODUCTION: Snowboarding is a dynamic winter sport requiring a high level of coordination, balance, and lower-limb strength. Board control is achieved through asymmetrical loading of the legs, with the leading leg determining the stance (regular or goofy) and playing a primary role in directing and stabilizing movement, while the rear leg actively contributes to force control and the turn radius. However, the leading leg does not always correspond to the functionally stronger limb. Previous studies have shown that the choice of the leading leg is not solely determined by motor dominance, and strength asymmetries between the lower limbs may affect technique, balance, and injury risk. The aim of this study was to examine the existence of a relationship between the leading leg in snowboarders and lower-limb strength characteristics, measured via vertical jump on a force plate. The study is pilot in nature and aims to provide initial data that will facilitate further research on the influence of dominant posture on lower limb strength performance.

METHODS: The study included 34 snowboarders (17 women and 17 men) with an advanced level of training, including some registered competitors. The leading leg was determined through a questionnaire, and lower-limb strength characteristics were assessed via vertical jump on a force plate. The primary parameter was Peak Loading Force (N), reflecting the maximum force applied on the platform during the jump and serving as an indicator of explosive strength and functional capacity of the leg. For statistical analysis, a paired t-test and correlation analysis were used.

RESULTS: Analysis of Peak Loading Force did not reveal statistically significant differences between the left and right legs in the 34 snowboarders studied (paired t-test: $t(33) = -0.219$, $p \approx 0.827$). The null hypothesis could not be rejected, indicating that the observed differences are random and not systematic for the group. Comparison between the subjectively determined leading leg and the objectively stronger leg showed agreement in 12 of 34 participants (≈35%), demonstrating a lack of significant relationship between the preferred stance (regular/goofy) and strength parameters.

DISCUSSION: The results indicate that the leading leg cannot be regarded as a reliable indicator of lower-limb strength dominance in snowboarders. The choice of leading leg is likely determined by a complex interaction of coordination, biomechanical, and subjective factors rather than absolute muscle strength. Similar observations from previous research indicate that the dominant limb in specific sports does not always correspond to the stronger limb measured through objective tests. In the context of snowboarding, this may be explained by the differing functional roles of the front and rear legs, with the rear leg often performing a more forceful and stabilizing function regardless of the preferred stance. From a practical perspective, the findings emphasize the need for training programs to focus on balanced development of strength and control in both legs to optimize technique, enhance stability, and reduce the risk of functional asymmetries and injuries.

Keywords: snowboarding, leading leg, lower-limb strength parameters, force plate, Peak Loading Force.

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PROFESSIONAL ABSTRACTS

QUALITY ASSURANCE AND ENHANCEMENT IN SUPPORT OF STAFF READINESS AND PROFESSIONAL LEARNING

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INTRODUCTION: Delivering consistent assessment and professional development across a geographically broad region remains a significant challenge for instructor education systems. While standards and credentialing frameworks provide common reference points, consistency in practice ultimately depends on the preparation, alignment, and ongoing development of the staff who implement them.

DISCUSSION: This presentation shares the PSIA-AASI Rocky Mountain Region's approach to building a sustainable Quality Assurance and Enhancement (QAE) system designed to support staff readiness, strengthen assessment consistency, and promote continuous professional learning.

Keywords: staff preparation, sustainable systems, consistent assessment, professional learning.

SPORTS COORDINATION OF STUDENT-ATHLETES IN SECONDARY VOCATIONAL EDUCATION

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INTRODUCTION: The dual-career pathway of student-athletes represents a significant organizational and pedagogical challenge, particularly within secondary vocational and technical education. In Slovenia, a nationally regulated and officially recognized dual-career system is established for general upper secondary programmes (gimnazija), ensuring structured academic adaptations for student-athletes. However, secondary vocational schools operate under more rigid curricular structures, including compulsory practical training with employers, modular assessments, and fixed scheduling frameworks, which limit flexibility. These structural characteristics create additional coordination demands, especially for athletes competing in highly seasonal and training-intensive sports such as Alpine skiing and Nordic skiing (cross-country skiing). In this contribution, we examine the role of the Individualized Education Plan (IEP) as a central coordination instrument in managing dual careers within vocational education and compare this context with the officially recognized academic secondary school model.

METHODS: We conducted a qualitative analysis that included a review of Slovenian educational legislation regulating student-athlete status, a comparative examination of dual-career arrangements in gimnazija and vocational programmes, and professional reflection derived from practical coordination experience. We further applied a case-based approach using examples from Alpine skiing and Nordic skiing, where competition calendars, altitude training camps, and international events significantly interfere with the academic schedule. Particular attention was given to structural constraints specific to vocational education, especially compulsory practical training with employers and modular assessment systems. We focused on planning processes, stakeholder roles, and adaptation mechanisms within the Individualized Education Plan.

RESULTS: Our findings indicate that while academic secondary school programmes benefit from a standardized systemic framework, vocational schools rely more heavily on individualized and institution-specific solutions. We identify the Individualized Education Plan as the key strategic and operational document enabling coordination between school leadership, teachers, coaches, parents, and student-athletes. Effective implementation requires early annual planning aligned with training and competition cycles, flexible assessment strategies, adapted deadlines, compensatory solutions for practical training, and continuous monitoring of academic progress. In winter sports, peak competition periods frequently coincide with assessment phases, which requires proactive scheduling and strong institutional support. We further observe that successful coordination depends on clearly defined responsibilities and consistent communication among all stakeholders.

DISCUSSION: Based on our analysis, we argue that secondary vocational education would benefit from a more structured national framework for dual-career support. While institutional flexibility allows tailored solutions, the absence of formalized systemic guidelines may result in inconsistencies. We therefore propose strengthening the role of the Individualized

Education Plan, clarifying coordination competencies, and developing national recommendations specifically adapted to vocational programmes. Through examples from Alpine and Nordic skiing, we contribute to the broader international discussion on balancing academic and elite sport development, particularly in vocational education contexts.

Keywords: dual career, student-athletes, secondary vocational education, individualized education plan, sport coordination.

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DUAL CAREER OF ATHLETES IN SKIING

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INTRODUCTION: Dual career (DC) refers to the coordinated development of athletic performance and formal education or vocational preparation. Although dual career has been extensively examined across various Olympic sports, skiing remains underrepresented in discipline-specific analyses. Due to seasonal competition calendars, altitude training camps, early specialization, and frequent international travel, skiing athletes face specific academic, organizational, and psychosocial constraints. The aim of this research was to systematically review and synthesize existing scientific literature addressing dual career pathways, challenges, and support mechanisms in skiing.

METHODS: A structured literature review was conducted using major academic databases including Scopus, Web of Science, SPORTDiscus, and Google Scholar. Search terms combined 'dual career', 'student-athletes', 'winter sports', 'skiing', and 'career transition'. Peer-reviewed empirical and theoretical publications, as well as relevant European policy documents, were screened for relevance and analyzed using thematic synthesis.

RESULTS: The available literature demonstrates limited skiing-specific evidence, with most findings embedded in broader European dual career discourse. Three principal thematic domains were identified: (1) structural constraints related to intensive winter competition and mobility; (2) psychosocial determinants including time-management skills, autonomy, and social support from coaches and family; and (3) governance and institutional mechanisms such as academic flexibility, distance learning, and mentoring systems.

DISCUSSION: The ecological and organizational characteristics of skiing require tailored dual career frameworks. Integrated cooperation between sport organizations and educational institutions, flexible academic arrangements, and proactive career planning appear central to sustainable athlete development. Strengthening skiing-specific research is necessary to inform policy design and improve long-term athlete welfare within winter sport systems.

Keywords: dual career, skiing, winter sports, student-athletes, academic support.

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JOINT TECHNICAL CAMPS AS A STRATEGY FOR TALENT DEVELOPMENT IN SLOVENIAN ALPINE SKIING

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INTRODUCTION: Alpine ski racing in Slovenia has traditionally relied on a limited athlete base because of the country's small population. Despite international success, recent demographic trends and changing patterns of sports participation have further reduced the pool of young competitive skiers. In earlier development phases, national-level technical camps jointly organised by the Ski Association of Slovenia and the Ski Instructors Association of Slovenia played an important role in supporting youth athlete development; however, these initiatives were discontinued for several years. In response to current challenges, both organisations restarted the structured national technical camp programme last year, aiming to revitalise systematic technical development and strengthen the talent pathway.

METHODS: The reintroduced technical camp programme targeted youth and junior alpine skiers from regional clubs and was implemented during the most recent competitive season. Experts from the Ski Association of Slovenia and the Ski Instructors Association of Slovenia jointly designed and delivered the camps, combining high-performance coaching perspectives with established instructional methodology. Athlete progression was monitored through technical evaluations.

RESULTS: The restart of the technical camps led to renewed engagement from regional clubs and increased participation by young athletes. Initial assessments showed improvements in technical consistency among camp participants. These observations are consistent with previously reported relationships between motor abilities, expert technical evaluation, and competitive success in young alpine skiers.

DISCUSSION: The joint reintroduction of structured technical camps by the Ski Association of Slovenia and the Ski Instructors Association of Slovenia effectively addresses the limitations of a small talent pool in alpine ski racing. By integrating federative development objectives with instructional expertise and evidence-based practice, the programme strengthens the national youth development framework and provides a transferable model for other small alpine skiing nations.

Keywords: alpine skiing, talent development, motor abilities, technical camps, performance evaluation

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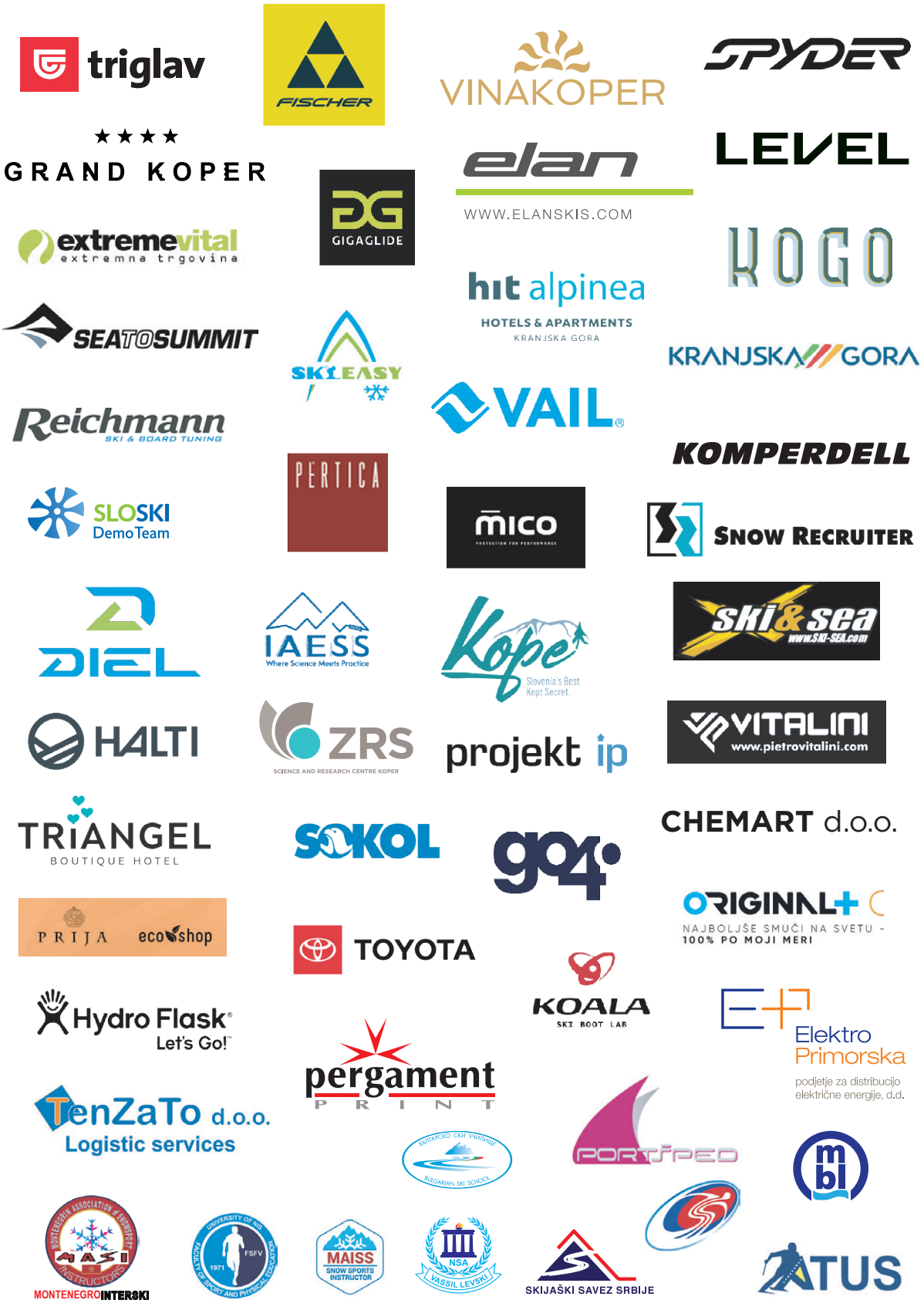
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