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Call for the application of a biopsychosocial and interdisciplinary approach to the return-to-sport framework of snow sports athletes

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ABSTRACT

Snow sports such as alpine skiing or snowboarding are associated with a high risk of injury and reinjury and are subject to a very special environment with specific rehabilitation challenges that must be addressed.

Due to geographic decentralisation, seasonal climatic limitations, alternation of training in off-snow and on-snow settings and unique loading patterns of practising these sports, special rehabilitation structures and processes are required compared with other sports. In addition, returning to preinjury performance requires a high level of confidence and a resumption of risk-taking in demanding situations such as high-speed skiing and high-amplitude jumps. A biopsychosocial and interdisciplinary approach can be viewed as a holistic, athlete-centred approach that promotes interprofessional communication and collaboration. This is particularly central for managing the physical/biological, psychological and social demands of injury management for snow sports. It can help ensure that rehabilitation content is well coordinated and tailored to individual needs. This is because transitions between different rehabilitation phases and caring professionals are well aligned, and rehabilitation is understood not only as purely 'physical recovery' but also as 'psychological recovery' considering the snow sports-specific setting with specific social norms. Ultimately, this may improve the rehabilitation success of snow sports athletes.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In the context of the rehabilitation of athletes, special sport-specific challenges need to be solved.

⇒ Typically, different rehabilitation contents are delivered to athletes independently by different professional groups.

⇒ In addition to purely physical recovery, psychological recovery and the influence of social norms are often not sufficiently considered, which can harm the return to athletic success.

WHAT THIS STUDY ADDS

⇒ Snow sports such as alpine skiing or snowboarding are known as high-risk sports and entail relatively high rates of injury and reinjury.

⇒ The snow sport-specific rehabilitation challenges that need to be managed include a high degree of geographical decentralisation, seasonal climatic constraints, alternating off-snow and on-snow training, unique loading patterns with high forces and quasi-isometric-eccentric muscle actions, and regaining superior confidence to resume risk-taking in demanding situations such as high-speed descents or massive jumps. In addition, the sociocultural norms specific to snow sports entail a culture of sensation seeking, spectacle and heroism, further challenging rationally oriented pathways to return-to-sport (RTS).

⇒ A potential solution to adequately address these issues could be applying a biopsychosocial and interdisciplinary approach to snow sports athletes' RTS framework.

⇒ Such an approach represents a holistic, athlete-centred approach that promotes interprofessional communication and collaboration, which is particularly important to ensure a common thread throughout the entire RTS process.

⇒ RTS paradigms in snow sports should shift towards rehabilitation being understood not only as purely 'physical recovery' but also as 'psychological recovery' considering the setting with specific social norms.

⇒ There is a need for more in-depth knowledge and understanding of the needs of the different stakeholders in the field of RTS of snow sports athletes and to derive sport-specific implications for practice.

Snow sports such as alpine skiing or snowboarding entail a relatively high risk of injury and reinjury,[1–4] and despite numerous similarities between the return-to-sport (RTS) of athletes in different sports, snow sports are subject to a very special environment with specific rehabilitation challenges to be solved. Thus, the physical/biological, psychological and social obstacles faced by snow sports athletes after a severe injury are considerable and complex.

With regard to physical/biological aspects, it is not only the regaining of pain-free movement, adequate laterality and physical fitness capacities such as aerobic endurance, muscular strength (especially muscle power

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and rate of force development—RFD) and movement coordination that are important,[5 6] but also restoring snow sport-specific work capacity to withstand the high-force, quasi-isometric–eccentric muscle actions occurring in alpine skiing, for instance.[7] Moreover, an additional snow sport-specific challenge is that in addition to the classic off-snow rehabilitation content, there are no clear evidence-based protocols for the return to snow. Unlike in most other sports, the change between rehabilitation phases also means a change in setting and persons in charge (clinical setting, off-snow training setting, on-snow training setting), which is associated with high travel and constantly changing team constellations and requires superior communication between all specialists involved. Such geographical decentralisation in addition to seasonal climatic constraints plausibly requires specific forms of process organisation that are hardly comparable to those in other sports.

In connection with psychological aspects, the performance-determining requirement and individual willingness to take risks again expose athletes to complex psychological challenges on their RTS journeys. Indeed, in snow sports, returning to preinjury performance requires a high level of confidence and, to a greater extent than in other sports, resuming risk-taking in demanding situations such as high-speed downhill sections or massive jumps. This is particularly also behind the background that, in snow sports, there are situations that require considerable courage and overcoming, and there is generally a relatively high risk of reinjury.[4] Moreover, at a young age, snow sports athletes depend on their parents' massive financial and time-intensive support. The more one invests, the greater the pressure increases due to one's and others' expectations. In the RTS context, these self-imposed expectations are increased even more because of the potential for interpersonal benchmarking of one's recovery process to that of other athletes. Deviations, especially if the rehabilitation takes longer, lead to increased internal and external pressure. Coping strategies for such challenging situations have high relevance in fulfilling the specific demands of a particular sport.[8] Moreover, positive and realistic self-confidence is essential for returning to the preinjury level of participation and returning to sport more quickly.[9] This is crucial because the assessment of risks and the associated decision-making and action processes are fundamental for the safe performance of snow sports and therefore have great potential for (re) injury prevention.

Finally, regarding social aspects, snow sport-specific sociocultural norms may also play an important role in athletes' RTS pathways. For example, the culture of spectacle and heroism inherent in snow sports, which is associated with events such as alpine downhill or freestyle big air competitions, may present additional challenges for the athlete during RTS.

Facing these snow sport-specific and complex challenges, we advocate applying a *biopsychosocial* and *interdisciplinary* approach to snow sport athletes' RTS framework.

THE PREVENTION OF (RE)INJURIES IN SNOW SPORTS: A MAJOR UNSOLVED PROBLEM

For example, ACL injuries are particularly common in competitive alpine skiing. The risk of ACL injury during a season is 5%–15%, depending on the study.[1 3 10] In this context, previous injury is a common confounding factor in the risk of a future injury. It is well known that the risk of ACL reinjury is increased fourfold during the next 2 years and that during the first 9 months after ACL reconstruction, the rate of reinjury is reduced by more than 50% when RTS is delayed by a month to promote recovery.[11] In the specific case of competitive alpine skiers, a recent study reported that 50% of all ski racers with a cruciate ligament rupture suffer a second ACL injury after returning to top sports, often more than 2 years after the initial injury.[4]

Accordingly, much is invested in training and testing the most important physical factors for successful rehabilitation and reduction of subsequent injuries. For example, there are findings on reinjury risk that symmetrical quadriceps strength reduces the risk after ACL reconstruction.[11] Moreover, more complex components, such as jump landing and postural control measures, have also been suggested to predict ACL reinjury.[12 13] However, it is also undisputed that psychosocial factors can have a positive influence on the rehabilitation process.[14] The greatest influence in connection with the chance of a successful RTS is high self-efficacy, a high internal locus of control and a low level of anxiety.[15–17] In addition, autonomy, competence and relatedness have positive effects on rehabilitation and return to the preinjury level.[18] From an implementation perspective, therefore, in addition to testing and screening, appropriate physical and mental training programmes to prevent the most common (re)injuries should ultimately be applied to athletes of all age and performance levels. Furthermore, once the specific content for reinjury prevention is defined, special emphasis should be given to appropriate knowledge dissemination and implementation frameworks.

However, regardless of the substantial body of RTS-related knowledge available to date, it should be noted that in real-life sport settings (where the social context also plays an important role), more holistic perspectives that consider more than just the individual dimensions, such as a biopsychosocial and interdisciplinary approach, are rarely applied in athletes' RTS.[19] This also applies to the area of snow sports, where the rate of reinjury is still relatively high.[4 20] Despite the aforementioned complexity of rehabilitation in snow sports, there is no internationally recognised and applied common framework or protocol that addresses the physical/biological, psychological and social aspects of RTS in snow sports.

WHAT ARE THE DEMANDS FOR IDEAL RTS IN SNOW SPORTS?

As already highlighted above, a major challenge in snow sports is coping strategies with multiple RTS settings (clinical, off-snow training, on-snow training), resulting in a high degree of travelling and decentralisation, as well as a constantly changing RTS team constellation while it is always the same athlete recovering from the injury. This may be best addressed by flexible RTS frameworks and superior communication between all specialists involved. This is well illustrated by the example of well-being in feeling safe, which is an important factor in the rehabilitation process.[9] In this context, the environment has a major influence. However, it is exactly this that changes abruptly in the case of an injury; typically, the athlete is separated from his/her familiar sporting environment/team. Especially in difficult situations such as an injury, the unknown and new environment may become an additional burden. Therefore, the structures should allow flexibility to react to the prevailing demands and needs. For example, sporadic RTS training sessions at the same location as the team may not only increase the athlete's motivation but also influence his or her social integration and willingness to return to hard physical training.

The focus on individual needs and the associated flexibility does not exclude a structured and criteria-based RTS framework. Universal guidelines and timelines are nevertheless important. The content and organisation of the RTS transition as an integrative and individualised process should orientate on generally valid scientific evidence. Additionally, the process should continuously be monitored and evaluated based on predefined criteria.[21 22] As many different professionals are involved in a snow sport RTS pathway (eg, surgeons, physiotherapists, mental coaches, athletic trainers, on-snow coaches and, most importantly, athletes), maintaining flexible, sophisticated communication standards and constructive interactions among all are crucial. In this context, a recent case study presented a real-world RTS training plan for a female elite skier who sustained an ACL injury supported by an interdisciplinary performance team alongside neuromuscular testing and athlete monitoring.[23] The interdisciplinary performance team developed and worked according to a multifaceted training and testing plan that addressed logistics, the healing process, psychological readiness, functional milestones, work capacity and progression to support the entire RTS process.[23] Apart from that and with respect to a more holistic/sophisticated biopsychosocial and interdisciplinary approach, particularly in snow sports, evidence is scarce, and current practices lack harmonisation and communication across the different stakeholders/professions involved in RTS.

Most importantly, physical, psychological and social rehabilitation should be better aligned to be effective. Accordingly, rehabilitation approaches have been suggested to combine all the important factors into one process.[22] The understanding and knowledge of why a biopsychosocial and interdisciplinary approach is needed are obvious; nevertheless, as far as the implementation in real-world sports settings is concerned, holistic solutions simultaneously focusing on the dimensions of physical, psychological and social rehabilitation are widely lacking. Psychosocial interventions are almost completely detached from physiological interventions, and the social context is rarely considered.

A CALL FOR THE APPLICATION OF A BIOPSYCHOSOCIAL AND INTERDISCIPLINARY APPROACH TO THE RTS FRAMEWORK OF SNOW SPORTS ATHLETES

The biopsychosocial approach applied to the RTS of snow sports athletes can be considered a holistic and integrative concept rather than a combination of independent processes and should place the athlete as a whole in the centre. A biopsychosocial approach, therefore, should involve interprofessional communication and cooperation. As such, it offers the opportunity to take advantage of the interactions between the different disciplines involved in RTS. Moreover, aligning with the athlete's needs may help promote the exchange of information between all professionals involved, as well as tailor the rehabilitation measures to the specific individual, injury and setting.

At the same time, the advantage of a more holistic and integrative approach may also bring new challenges for RTS, such as prioritising and merging different sources of information and different interdisciplinary perspectives. Accordingly, further research efforts should focus in particular on the establishment of suitable snow sport-specific RTS protocols and on possible solutions to related issues of process organisation, responsibility and communication flow, as these aspects may become more complex when applying a biopsychosocial approach and expanding the interdisciplinarity. In this process, in addition to the still scarce scientific knowledge about RTS in snow sports, the perspectives of RTS stakeholders and athletes should be explored through a qualitative study to capture the full spectrum of needs of the real sports world and to further affirm our call for the application of a biopsychosocial and interdisciplinary approach to the RTS framework of snow sports athletes.

Nevertheless, despite the remaining challenges and knowledge gaps identified, we would like to strongly advocate the application of a biopsychosocial and interdisciplinary approach to the RTS framework of snow sports athletes. It not only meets to the holistic nature of the individual snow sports athlete but also may offer opportunities for the quality and effectiveness of rehabilitation programmes if implemented consistently. For this to succeed, a change in mindset and an active/constructive exchange between the different disciplines is necessary. Independent and uncoordinated action within and between different professions or individual rehabilitation phases cannot achieve the desired results. This is particularly true since the rational and efficient use of resources is crucial at all levels of snow sports.

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