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# REHABILITATION AND RECOVERY TRAINING AFTER SNOWBOARD ACCIDENTS

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## Abstract

**Objective:** We aim to optimize specific recovery training with special regard to the style of snowboarding performed by the victims.

**Background:** With increasing popularity of snowboarding, accidents and injuries happen more often, but until now there is little data on sports specific recovery. Consequently physiotherapy is often performed with "standard" procedures which don't take into account specific demands of snowboarding in general or the special demands of the different disciplines of snowboarding.

**Material and Methods:** Prospective observation of the course and result of rehabilitation performed according to the scheme described (open trial, n = 16). The paper also reviews the literature about the topic with special regard to the German literature, which is less easy accessible for the international reader.

**Conclusions & Clinical advantages:** All victims except one with spinal trauma recovered completely and went snowboarding the following season (some of them also for competitions). Recovery training of patients suffering from snowboard accidents should be started as soon as possible and sports specific demands should be taken into account. Optimal teamwork between the physician, the physiotherapist, the patient and the coach is necessary to optimize the results.

**Key words:** snowboard accidents, training, rehabilitation, winter sports

## Introduction

Snowboarding is one of the fastest growing disciplines of winter sports with 3.6 Million sportsmen in the USA (1998) compared to 9.1 Million skiers (1). Since Nagano 1998 it is one of the Olympic winter disciplines. Actually in some ski areas there are even more people snowboarding than skiing (2). Because of the growing popularity the number of accidents is increasing as well. It already ranks third of all sport accidents in Switzerland (3). Compared to skiers snowboarders are younger (11-42 years vs. 3-69 years) (4) and 74% of them are males (1).

One typical risk for snowboarders is that they are more often in open area off from prepared and guarded slopes. But the main reason for differences in accident mechanisms is the special pattern of movements with both shoes fixed on one board. The snowboard must be controlled by shifting the body's centre of gravity and by rotation of the body. Therefore snowboarding is often considered to be a good combination to wind surfing or skateboard. In contrast to skiing sticks are not needed and because safety bindings are not established the person is fixed to the board in case of an accident as well (4).

The data about the incidence of injuries are controversial: while some investigators found a similar incidence to ski accidents (5-7), others showed a 2-2.4:1 ratio (3,8). Ronning et al. calculated a distance - correlated injury index being 3-4 times higher for snowboarders than to downhill or telemark skiers (9). Most studies show snowboard injuries less severe than others (3,7,10), but some just the opposite (11). These various results may be a consequence of differences in the collectives investigated.

## Characteristics of snowboard accidents and injury patterns

Less than 50% of the snowboarders are educated by professional instructors. 42-58% of the injured persons are beginners (8,12-14), 83% don't wear any protectors and 80.7% of the accidents are caused by the victim himself (15). Compared to ski accidents most studies show significant more injuries of the arms and shoulders (about 50% of all injuries) (3,4,12,16,17), although some others show a contrary tendency (8). In contrast there is only half the frequency of knee injuries (snowboarding 17%, skiing 31%) while the number of head trauma is comparable, (17). In total,

about 10-30% of the snowboard injuries are dislocations and injuries of ligaments (4,12), 20-66% are fractures (4,8,12). Severe injuries are caused by defects in the material (15), which, of course, is only one of several reasons for accidents, e.g. collisions. While there is only a minimal increasing frequency of injuries of the arm which is in front (in the direction of gliding) there are significant more injuries of the frontal leg (80% vs. 20%) (15,18,19).

The injury most common in snowboarding is caused by a fall on the wrist in hyperextended position (3,4,12,16,17), an injury which could be reduced by 50% if wrist guards would be used consequently (12-14). Fractures or dislocations of the shoulders – about 2/3 of all dislocations – are a result of a direct trauma as well (20) while fractures of the elbow normally will be caused by a fall on the stretched arm (1). Injuries of the legs are most common if one binding unties while the other is still fixed. Then the board is a long lever which transmits enormous forces on the leg fixed to the board. This causes injuries or fractures of the ankle especially if soft boots are used (15). Another mechanism – accelerated dorsal flexion and associated with an inversion of the hind foot and an axial impact – is also a typical cause of ankle fracture (“snowboarder’s ankle”).

In contrast “boot top fractures“ of the tibia or fibula are located at the top rim of the boots and most common if hard boots are used (20). Knee injuries - although relatively rare - most often happen while using ski lifts, because the front foot is fixed in rotated position on the board while the other foot is used for pushing (20).

Snowboarders more often suffer from fractures of the vertebral column than skiers because they tend to fall more often backwards. The fall will be stopped by the backside and the impact is going to be transmitted directly on the vertebral column (21-23). Another important mechanism of vertebral column injuries is the impact caused by a missed landing, especially in freestyle snowboarding.

Cerebral injuries are more common in advanced athletes and caused by direct trauma (falls backward) at high speed, collisions or acrobatics (22,23). A rare injury – although characteristic for snowboarding in contrast to other winter sport disciplines – is vulva trauma caused by if women tumble onto the binding of the snowboard at the same time that one foot was left off the board and the binding was not turned down but left erect (24). 51% of the victims suffer from haematoma, 26% from haematoma with lacerated injury, and 23% from laceration (24). 69% of them need surgical treatment (24). Overstrain injuries were described and most often located at the ankles, knees, hip joint and the lumbar spine (25).

### **Rehabilitation and training for recreational snowboarder**

In contrast to skiing the rehabilitation for snowboarders takes a focus on balance and on the strength of the lower body. Moreover any training as well as rehabilitation should take the individual kind of snowboarding (intensity, recreational, competition, free style...) into account. We use the term “recreational snowboarder” to describe a person, who uses the board one or two weeks a year just for fun. In contrast “competition snowboarder” describes sportsmen who perform advanced training and regularly join competitions. Here two subgroups should be differentiated: racing and freestyle. A mixture of these styles is boarder cross, a discipline with growing interest since about two years. Of course the following suggestions must be adjusted taking into account individual limitations caused by disease or injury, the personal goal of the patient and how intensive he performs the training.

Because most riders are relatively young and very active, one of the first steps in rehabilitation should be to teach adequate load. Otherwise there will be the risk of further injuries. The next step is the maintenance or the recovery of the muscular strength especially of the legs and the trunk, the latter being the proximal control of the selective movement of the legs to steer the board. Here techniques like Brunkow (a neurophysiological technique to redevelop physiological pattern of movement by using isometric tension) (26) are ideal in the beginning, later followed by proprioceptive neuromuscular facilitation (PNF) (27). The invigoration of the muscles should be combined with stretching, e.g. by postisometric relaxation.

These exercises should be combined with a training of the coordinative capabilities of the patient, e.g. to allow the edging of the board by a controlled shift of the body’s weight from the anterior to the posterior leg and a dosed flexion of the legs. Therefore devices like a therapy – gyroscope, a balance pad, a soft- soil- mat, or a swingboard are ideal. By changing resistances, given by the therapist, there will be a simultaneous improvement of the stability of the leg’s axis.

If the patient’s muscular strength is nearly normal again, the next step should be to teach responsible training which should combine general fitness training – often well-known by the patients – with stretching and probably the correct use of dumbbells and training machines. When the normal level of performance is reached the patient can start his regular training and snowboarding as usual.

### **Rehabilitation and training for competition snowboarder**

The early phase of rehabilitation should be similar to those of recreational snowboarders as described

above. But the training should be more intense and there should be a more pronounced increase in the loads. This more intense training takes into account that competition sportsmen have to perform their training as soon as possible on the snowboard again in order to train the very specific patterns of movements. Again it should be pointed out that teaching an adequate load to prevent further injuries is one of the most urgent goals especially at the beginning of the rehabilitation.

In contrast to the recreational boarders the general fitness is an integrated part of the rehabilitation of competition sportsmen. Every practice should contain a fitness training of at least 30 minutes in the beginning. In the course of rehabilitation the load as well as the duration of this training has to be adjusted to the actual performance of the patient. As soon as possible the training should be performed at least four times a week with one day off for recreation. The fitness training should be combined with exercises to strengthen the muscles of the trunk and the legs, exercises to stabilize the axis of the legs and exercises to improve coordination.

As soon as the patient learned appropriate training and the first steps of stabilization are realized, the sportsman should perform responsible training himself. Therefore it is useful to realize the recovery training as series of exercises planned by the therapist and performed by the rider under supervision of the therapist. This differs from a therapy of normal patients or recreational sportsmen where the therapist is close involved in the exercises actually done by the patient. As soon as possible a careful training on the snowboard should be started. Therefore a regular and direct communication between the therapist and the rider's personal trainer is necessary, especially the increase of intensity and technical difficulty of snowboarding should be discussed.

In snowboard racing, i.e. giant slalom, slalom, parallel slalom and banked slalom, timing, vertical movements and dynamics are of special interest to be able to realize a fast change of the edges between the single turns. Additional to the therapeutic goals described above a special training of resilience of the legs is necessary but in case of an injury of the legs it should not be started until the first part of rehabilitation was successful. To realize this therapeutic goal, dynamic exercises of the muscular strength on the soft-soil-mat should be especially recommended. At the stage of advanced training "low branch training" can be enclosed carefully. In contrast to recreational snowboarding competition snowboarding needs a year-around training of fitness as well as of techniques. Therefore it is necessary to include snowboarding as soon as possible into the course of rehabilitation. Of course, limitations by the injury must be taken into account and the ac-

tivity should be started step by step, beginning in safe and on easy slopes. If snowboarding is impossible, e.g. inline skating is a useful substitute.

Similar to snowboard – racing the priority of the demands of snowboard- freestyle is focused on the muscular strength of the legs because the athlete must force himself from the ramp or halfpipe just before each jump. Additionally there are extensive demands on coordinative capabilities. Some of the motions can be already trained at the advanced stage of rehabilitation, e.g. using a trampoline. But basic coordinative training is possible even before by using a labile base, e.g. balance pad, therapy – gyroscope or soft-soil-mat and forcing the coordinative demands by catching a ball, while standing on these devices.

Recovery training for boarder cross ("Boarder-X") takes the characteristics of this variant into account: elements of racing and freestyle are combined, the parcour contains obstacles that must be passed, but in contrast to typical freestyle jumps it is just simple jumps without additional manoeuvres, another point is that a fast time is important. In consequence the demands on coordination are a little minor than in freestyle. The recovery training should be based on the recommendations for competition boarding, but it should also include some coordinative exercises of increasing difficulty, e.g. a combination of less stable position and additional task. The final exercise could be standing on one leg on a soft-soil-mat and catching of balls.

### **Experience with the strategy**

Up to now 16 snowboarders joined our recovery programme. Three of them were competition boarder (2 freestyle, 1 boarder-X), the others recreation boarders. Except one, no participant suffered from an arm injury, although about 50% of all snowboarding injuries are located there (3,4,16). Obviously patients with these injuries tend to join "normal" physiotherapy or get back on their boards regardless. The other cases were "boot top fractures" (n = 7), knee injuries (n = 4), tibia fractures more proximal located than "boot top fractures" (n = 3), and one patient with a fracture of two spinous processes of the lumbar spine. Except the latter all patients were initially treated with internal fixation by osteosynthesis. Rehabilitation started at day 3-5 with injury specific exercises. During the second week sports specific exercises were combined. Rehabilitation periods ranged from six to ten weeks. All patients (except the patient with the spinal injury) were active snowboarders in the following winter again without any problems.

### **Conclusions**

The recovery training of patients suffering from snowboard accidents should be started as soon as

possible and sports specific demands should be taken into account. Optimal teamwork of the physician, the physiotherapist, the patient himself and in case the trainer is necessary to obtain optimal results. It should be pointed out that protective devices, i.e. wrist guards, which unfortunately are not regularly used in snowboarding, are even more important for recovery training.

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