Snowboarding Injuries 2014

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  ⇒ Arthrex
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Injuries in elite and recreational snowboarders

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ABSTRACT
Background The relatively young sport of snowboarding exhibits high injury rates. The current efforts to characterise the injury pattern of snowboarders focus largely on the general snowboard population and upper extremity injuries, the most common injury site in snowboarders as a whole.

Methods In an effort to describe the current published information available on snowboarding injuries in the elite-level population, a literature search was performed and the articles related to snowboarding injuries were analysed. Additionally, the literature pertaining to biomechanical analyses of injury and injury prevention was included.
History

♦ Sherman Poppen
♦ Engineer in Muskegon, Michigan
♦ Surfer
♦ 1966

⇒ 2 skis together for his daughter Wendy
The Snurfer

- $15
- Bowling ball factory Michigan
- 1 million made over 10 years
- Largely disappeared in a few years
Modern Snowboard

♦ Jake (Burton) Carpenter
♦ Starts Burton in 1977
♦ Coins the term *Snowboard*

♦ Tom Simms starts Simms in 1977

♦ Several others
First Boards had no binding but a leash

Carpenter starts putting water-ski bindings on his boards

Steve Derrah invents the modern binding
1980 only 7% of resorts allowed Snowboarding

Three in the US

- Mad River Glen
- Deer Valley
- Alta
♦ One of the most popular winter sports

♦ An estimated 7.3 million people participated in snowboarding in the USA alone during the 2012/2013 season.

♦ 8.2 million skiers.
Initially banned from many resorts and only recognized as an Olympic event in 1998.

Snowboarding now an established and popular event on the world stage.
Injury rates have evolved and grown with the sport

Currently snowboarders are more likely to injure themselves than skiers

<p>| Table 1: Injury Incidence in snowboarding and skiing: reported overall incidence of injuries |
|---------------------------------------------------|--------------|--------------|</p>
<table>
<thead>
<tr>
<th>Study Year</th>
<th>Event</th>
<th>Snowboarding</th>
<th>Skiing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladin '93 [13]</td>
<td>4.2 injuries/1000 visits</td>
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</table>
| Hagel '04 [41] | 1.15 injuries/1000 participants
1.16 injuries/1000 outings | - |
| Xiang '05 [23] | 13.5 injuries/1000 participants* | - |
| Sakamoto '08 [16] | 175 injuries/100,000 lift tickets** | 80 injuries/100,000 lift tickets |
| Kim '12 [5] | 345 Mean Days Between Injury | 400 Mean Days Between Injury |

* includes only 18-24 age group
** average of 2 most recent time periods
While the injury rates for skiing have largely stabilized, the injury rates for snowboarding are still increasing.
Many epidemiological studies on snowboard injuries have identified the upper extremity as the most prevalent.

- Particularly wrist and head injuries.
However these injuries are more prevalent in beginners.

Experienced snowboarders exhibit different injury patterns with increased injuries to the lower extremity.
The injury mechanisms for those at the *beginner* level are more related to isolated falls.

Preventative measures such as wrist guards and helmet use have been developed and proven to be effective.
In contrast, without a biomechanical understanding of the etiology of the lower extremity injuries that occur at the experienced level, it is difficult to establish preventative measures for this elite-level group.
By our compilation, injuries to the upper extremity represent 45% of snowboarding injuries, which is the largest proportion of injury location.

The lower extremities are injured half as often 23%, which is in direct contrast to the typical skiing injury pattern.
Wrist *injuries* alone, mainly wrist fractures, are the most common upper extremity and overall injury.

Head, face and neck injuries, especially contusions and concussions, are also frequent.
While some have reported head injuries as more common among the snowboarders than the skiers, the mean rates between the two sports appear to be equivalent based on our compilation.
Average knee injury incidence is described as markedly lower for snowboarding when compared with skiing.

Ankle injuries are slightly more common in snowboarding and include both sprains and fractures.
How do they happen?

- **Falls**, whether on the slopes or when landing from a jump, generate 80–90% of the injuries.

- *Collisions are relatively rare in snowboarding* compared with skiing, and constitute most of the remaining injuries.

- Injuries when landing from jumps are more common in snowboarding than in skiing, and when separated from isolated falls, account for approximately 25% of all injuries.
Skill level dependant injury pattern

- In surveys that encompass all snowboarders, an average of
  - 50% identified themselves as ‘novice’ or ‘beginner’
  - 37% as ‘intermediate’
  - 13% as ‘advanced’

- The majority of participants in snowboarding are described as beginners who have had little to no professional instruction

*This group experiences a large share of the injuries*
Studies specific to those at the elite level consistently report an elevated incidence of high-severity injuries.

A 2013 report (Major) found that 72% of World Cup snowboarding injuries resulted in time loss and that severe injuries were the most common injury type for snowboarders (42%).

As opposed to slight, moderate, mild or minimal severity classifications.
This increase in the injury severity among the elite-level snowboarders is additionally exemplified by a 2009 survey of World Cup Ski and Snowboard athletes.

Severe injuries were the most common injury classification, and it was estimated that the annual risk of severe injuries among the professional snowboarders is comparable to that of NFL players.

1/3 of World Cup snowboarders experiencing a time-loss injury during the winter season.
♦ Incidences of high time-loss injuries (such as ACL tears) are likely to be underestimated due to the nature of prospective and retrospective analyses of the elite-level snowboarding injuries.

♦ This is supported by two separate retrospective surveys of the elite-level snowboarders, which reported that 50% and 67% of time-loss injuries occurred outside of competition.
In *elite* snowboarders, injuries specifically to the wrist represent only 5–6% of all injuries.

The knee appears to have elevated rates for the elite population compared with the general snowboarding population.
The overall percentage of lower extremity injuries is increased to some extent in the elite-level snowboarders compared with all snowboarders.

Knee injuries represent the greatest increase in injury location when elite-level snowboarders are considered independently.
These percentages increase dramatically for the elite-level snowboarding population, where knee injuries are often the most common injury site and the rates reside at just under 20% of all injuries.

In fact, a recent survey of World Cup athletes reported no difference in the number of knee injuries between snowboarders and alpine skiers.
It is important to note the different stances in snowboarding compared with skiing when considering the lower extremity injury.

There are two stances:
- ‘regular’ stance where the left leg is the leading leg
- ‘goofy’ stance where the right leg is in front

In addition, a snowboarder can ride ‘switch’ where the leading leg is the non-preferred leg.

While a difference in injury pattern between riding regular, goofy or switch has not been established, it is reported consistently that the leading leg in snowboarders is injured more often than the trailing leg.
90% of lower extremity injuries and 89% of ACL injuries (33 of 37 participants) affect the leading leg

Davidson reported that the difference in the number of injuries for the leading and trailing legs was present for both knee and ankle injuries, but was only significant for knee injuries

No correlation for upper extremity
Of the various knee structures, the medial collateral ligament MCL and ACL are the most commonly injured.

Kim reported in 2012 that injuries to the MCL and ACL were in the top 10 injuries among all snowboarders.
The Colorado Snowboarding Injury Survey’s 8-year results reported 644 knee injuries,

- 275 MCL
- 144 ACL

However, the beginners were more susceptible to MCL injuries, while 85% of the ACL injuries were to either expert or intermediate riders.
CONCLUSION

- Significantly divergent injury pattern when experts are considered independently.

- The incidence of severe injury and lower extremity injury is increased and the incidence of upper extremity injury is decreased in the experts compared with beginner snowboarders.
Conclusion

- Unfortunately, biomechanical analyses of the mechanisms of these injuries are lacking, and consequently, injury prevention strategies are also lacking.

- For effective prevention measures to be developed, it is imperative to understand the biomechanical injury mechanism of action.
THANK YOU
Several methodologies for biomechanical analysis of the lower extremities have been tested, but have yet to provide adequate data to identify the in vivo injury mechanisms. In conjunction with biomechanical analyses, additional information about external risk factors such as equipment (bindings), environment (snow conditions) and events (half-pipe, snowboard cross) are needed to better elucidate the injury risk among the snowboarding community.
10 years, about 41.5 people have died skiing/snowboarding per year on average. During the 2011/12 season, 54 fatalities occurred out of the 51.0 million skier/snowboarder days reported for the season. Thirty-nine of the fatalities were skiers (33 male, 6 female) and 12 of the fatalities were snowboarders, (10 male, 2 female).
35,900 Americans died in motor-vehicle accidents;  
5,300 pedestrians were killed;  
8,600 died from unintentional public falls;  
4,500 died from unintentional public poisoning;  
2,400 people drowned while swimming in public areas;  
800 died while bicycle riding;
Regarding helmet use, 36 of those involved were reported as wearing a helmet at the time of the incident. The rate of fatality converts to 1.06 per million skier/snowboarder visits.
Serious Injuries - Serious injuries (paralysis, serious head, and other serious injuries) occur at the rate of about 44.7 per year, according to the NSAA. During the 2011/12 season, there were 510 serious injuries. Thirty-eight of the serious injuries occurred with skiers (30 male, 8 female) and 10 were snowboarders, (9 male, 1 female). Among the serious injuries, 30 of those involved were reported as wearing a helmet at the time of the incident. The rate of serious injury in 2011/12 was one per million skier/snowboarder visits.

Table
Table 1: Skiing/Snowboarding Fatality Rate Per Participant and Per Million Visits

- 2011/12 number of fatalities* 54
- 2011 number of ski/snowboard participants (in millions)** 9.8
- Fatalities per million participants 5.5
- Days of participation (in millions)* 51.0
- Fatalities per days of participation rate (per million) 1.06
Epidemiology

- Have snowboard injuries increased?
- The rate of injury for snowboarding as of the 2000/01 season has increased to 6.97 from 3.37 per 1,000 visits from 10 years ago, according to Dr. Shealy
Who gets fatally injured while skiing and snowboarding?

Most fatalities occur in the same population that engages in high-risk behavior. Victims are predominantly male (85 percent) from their late teens to late 30s (70 percent), according to Dr. Shealy. Less than 10 percent of fatally injured skiers and snowboarders are under 10 or over 50 years of age, but more than 16 percent of all skiers and snowboarders are in these age groups. Most of those fatally injured are above-average skiers and snowboarders who are going at high rates of speed on the margins of intermediate trails.
During the 2011/12 season there were 43 fatal incidents involving males, as opposed to eight fatal incidents involving females. Snowboarders don’t appear to be making the slopes less safe for their skiing peers, either, says Dr. Shealy. A study presented at the Ninth International Symposium on Skiing Trauma and Safety in 1993 indicated that 7.7 percent of all ski injuries are the result of skiers running into skiers, while only 2.6 percent of snowboard accidents are caused this way.

Has
The most recent helmet usage data clearly indicates that skiers and snowboarders already understand the importance of helmets. According to the 2011/12 NSAA National Demographic Study, 67 percent of skiers and snowboarders wore helmets while enjoying the slopes at the time of being interviewed, up 10 percent from the 2010/11 season and up 171 percent from the 2002/03 season when only 25 percent of skiers and snowboarders wore helmets. Data also shows that:

- 91
91 percent of children 9 years old or younger wear ski/snowboard helmets;
81 percent of children between 10 and 14 wear ski/snowboard helmets;
78 percent of adults over the age of 65 wear ski/snowboard helmets;
Skiers and snowboarders aged 18 to 24 have traditionally represented the lowest percentage of helmet use among all age groups. In 2011/12, 53 percent of all 18 to 24 year olds interviewed wore helmets, representing a 194 percent increase in usage for this age group since the 2002/03 season, when only 18 percent wore helmets.
recent research has shown that the use of helmet reduces the incidence of any head injury by 30 to 50 percent, but that the decrease in head injuries is generally limited to the less serious injuries. There has been no significant reduction in fatalities over the past nine seasons even as the use of helmets overall has increased. This trend emphasizes the importance of not increasing risk-taking behavior simply because you are wearing a helmet. Skiing and riding in control is essential in improving slope safety and reducing fatalities.
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