

Macho Man: Male participation and injury in down-hill skiing and snowboarding

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Introduction

As the popularity in down-hill skiing (hereafter – skiing) and snowboarding increases, there is more and more demand for ski hills to be created or existing ones to be expanded. Latent demand becomes effective demand as this former elitist sport is diffused to the masses through an increase in accessibility. As skiing and snowboarding participant numbers grow, a marked rise in injuries among participants has been noticed in snowboarding, but not skiing: “this surge of popularity has been accompanied by an increasing incidence of ...snowboarder trauma” (Siu et al., 2004). Skiing has shifted injury patterns from lower legs to knees: “From reports worldwide it can be seen that there has been a dramatic but selective decrease in the numbers of skiing injuries over the last 20 years” changing from ankle and tibia-fibula injuries in the 1940s to knee and upper extremity injuries today (Williams et al.,1995). But rates of injuries have remained in-line with skier increases.

Most of these injuries, as will be shown below, occur in young people with the overwhelming proportion of injuries taking place in males. Is this due to social constructions of masculinity where males must act macho and take risks that they judge are small? Or simply due to the fact that more males participate in skiing and snowboarding than do females? What motivates this urge for optimal arousal through high risk activities? This paper will look at 22 prior studies to determine why young males get injured in such disproportionate numbers while partaking in these ‘extreme’ sports; and will also consider what injuries are most common in skiing as opposed to snowboarding.

Purpose

The paper will study the link between male participation in skiing and snowboarding and related injury rates. From the review of past studies, it can be seen that males dominate both skiing and snowboarding (though snowboarding reveals a much larger inequality); even so, males appear to have a disproportionately high rate of injuries. Types of injuries vary between the two sports but also between male and female participants in the sports. The paper will draw personal experience and analyze 22 prior studies that looked at male-female participation in skiing and snowboarding, or papers that looked at injury patterns seen in skiers and snowboarders.

Methodology

To obtain results for analysis, 22 prior studies relating to skiing and snowboarding participation (male-female) or injury patterns (male-female, skier-snowboarder) were read and analyzed. Also reviewed are personal observations on snowboarding and skiing made over the past 3 years while I have worked in the ski and snowboard industry as a terrain park technician, at Blue Mountain in Ontario and High North Ski Camp in Whistler, British Columbia. A review of literature, study results, and conclusions are listed below and include participation rates and gender distribution for the two sports, recommendations on ways to reduce the various injuries, and potential reasons for such large inequalities in injury distribution among the sexes. Calculations are made where the data exists but the numbers were not present, the results will be included.

Literature Review and Results

For this paper, 22 academic works were reviewed. These works related to skiing and snowboarding participation (male-female), injury patterns (male-female, skier-snowboarder), motivations to take risks, or combinations of the three. There are many more studies available than reviewed but the data from 22 studies was believed to be sufficient.

The literature relating to motivation will be analyzed first. Hagel, B. et al. (2005) asked whether wearing a helmet increased the aggressive attitudes of snowboarders and skiers (theory of compensating behaviour or risk compensationⁱ). By analyzing non-head, face, or neck injuries they were able to conclude:

“Our results do not support a compensatory effect for helmet use in skiers and snowboarders in terms of increasing injury severity or high-energy crash circumstances... Whether it is the case that helmet users indeed do not take more risks or that cautious people wear helmets but do not increase their risk over other slope users, requires further research.” (Hagel, B. et al., 2005).

In the study it is seen that helmet use does not lead to more serious other body-area injuries (table 1), and may well indicate, though the authors will not make the conclusion, that helmet users do not take more risks to compensate for wearing a helmet thus the theory of compensating behaviour will not be applicable in this instance. Helmets do reduce injuries but wearing one does not seem to motivate skiers or snowboarders to take more risks.

The study undertaken by Slanger and Rudestam (1997) looked at motivation in terms of sensation seeking and self-efficacy. The study included only males and looked

ⁱ This theory of compensating behaviour or risk compensation suggests that each person has a target level of risk they are willing to accept (Hedlund, 2000). If a person perceives an intervention (e.g., ski helmet use) has lowered their level of risk, proponents of the theory argue users will change their behaviour to bring them back to their desired risk level (e.g., ski faster or more aggressively, on more difficult runs). (Hagel, B. et al., 2005).

at high risk sports. The first idea presented in this paper as that High risk sport participants did their sports as they typically served “the function of allaying anxieties about masculine inadequacy, that is to say, castration fear” (Rudestam, and Slanger, 1997).

Table 1 (Hagel, B. et al., 2005)

Outcome	Wearing helmet	
	No	Yes
Evacuated by ambulance^a		
Yes		
#	250	103
%	70.8	29.2
No		
#	2030	789
%	72.0	28.0
Matched ^b OR (95% CI)	1.0	1.14 (0.79–1.63)
Adjusted Matched OR (95% CI)	1.0	1.17 ^c (0.79–1.73)
Admitted to hospital^d		
Yes		
#	475	165
%	74.2	25.8
No		
#	1870	750
%	71.4	28.6
Matched ^b OR (95% CI)	1.0	0.70 (0.53–0.94)
Adjusted Matched OR (95% CI)	1.0	0.79 ^e (0.53–1.18)
Normal daily activities restricted =7 days^f		
Yes		
#	1525	488
%	75.8	24.2
No		
#	735	391
%	65.3	34.7
Matched ^b OR (95% CI)	1.0	0.61 (0.48–0.78)
Adjusted Matched OR (95% CI)	1.0	0.93 ^e (0.65–1.34)

This idea may serve to explain why more males participate in skiing and snowboarding, and why proportionally, more of them get injured. The authors also put forth the idea that:

“such physical pursuits as [extreme sports] are motivated by the need to raise an individual’s level of stimulation and excitement...[a theory] which assumes that susceptibility to lack of arousal, or boredom, varies among individuals and that they will seek differing amounts of stimulation to avoid it.” (Ibid)

Though difficult to prove, it is possible that males, in general, look for more opportunities (where risk is present) and strive for higher levels of stimulation to avoid boredom. With greater exposure to danger the chance of injury increases.

The authors also present the theory of self-efficacy in which participants in extreme sports view the dangers they put themselves in, in terms of manageable and unmanageable risks. They believe they make good decisions based on the risks. This self-efficacy leads participants is based on how well they judge they will be able to perform “and they tend to undertake and perform with assurance in activities they judge themselves capable of handling” (Ibid). As the study was done on male participants only, it is difficult to conclude that these ideas are only applicable to men, though it does indicate the motivations for taking on such dangerous activities.

The third study that deals with motivation indicates that non-skiers are constrained from skiing for fear of injury. This study was done on male and female subjects, with females ranking fear of injury higher than males (Gilbert and Hudson, 2000). Though not conclusive proof, this study lends credence to Slinger and Rudestam’s thoughts that males are higher risk takers who believe they can handle a dangerous situation (1997).

Studies looking at participation in the two sports and between the sexes will now be presented. Gilbert and Hudson present information that is mirrored in many other studies indicating that: “skiers are young, more affluent than the population in general, active sports enthusiasts with strong links to health and fitness, and predominantly male, aged between 15 and 34” (Gilbert and Hudson, 2000). Tammelin et al. (2003) found that skiing higher proportions of males were more likely to participate in downhill, as shown on table 2.

Table 2 (Tammelin et al., 2003)

Table 1. Participation in types of sports at age 14 years						
Sport	Males n=3664		Females n=4130		Total N=7794	
	%	n	%	n	%	n
Downhill skiing	4.5	165	3.2	132	3.8	297

In a study by Loes et al. it found that males (in their study) were exposed to more hours of participation than their female skiing counterparts (2000). Oates et al. screened 5646 skiers in their study and found that: “[screened skiers] averaged 84 days of skiing yearly. The average age was 32, and 3839 (68%) were men and 1807 (32%) were women” (1999). Geddes and Irish found that 30% of downhill alpine participants were snowboarders and that “snowboarders are 70% male, tend to be younger and unmarried” (2005).

All these studies show the male participation dominance in skiing (~68% of skiers) and snowboarding (~70% of snowboarders) exist. It is also shown that males participate in skiing and snowboarding more frequently or for longer periods at a time. The average age for participants is also low (15-32 for skiers), 17 - 22 for snowboarders (Englin, J. and Moeltner, K., 2004).

Injury rates in snowboarding and skiing have received a lot of attention in academic research. Sutherland et al. (1996) found that some injuries were more common in snowboarding, and others were more common in skiing (table 3).

Table 3 (Sutherland et al., 1996)**Table 1. Types of injuries sustained by skiers and snowboarders**

Type of injury	Ski	Snowboard
Laceration/cut	51 (13%)	5 (9%)
Ligament strain	166 (42%)	19 (33%)
Dislocation	20 (5%)	7 (12%)
Possible fracture	25 (6%)	7 (12%)
Probable fracture	44 (11%)	10 (17%)
Bruised	64 (16%)	4 (7%)
Head injury (minor)	17 (4%)	3 (5%)
Head injury (major)	6 (1%)	1 (2%)

This study, which covered two seasons found that:

“During the 1994 season, 757 injuries were treated by the ski patrol...in the 1995 season, 476 injuries were treated...31 snowboarding injuries in 1994, and 57 in 1995: 4% and 11% of all injuries respectively. In snowboarder, during 1994 90% of the injured were men, whilst only 56% of injured skiers were men...in 1995...[in regards to]snowboarding injuries...72% were men, while...men injured skiing remained similar at 52%”(Sutherland et al., 1996).

In 1996 it was estimated that snowboarders took up 10% (Ibid) of the slopes but we can see that in 1995 they accounted for 11% of the population. In 1994 Male skiers were injured at about the same proportion as they participate, but male snowboarders accounted for 90% of injuries while only accounting for 70% of participants. In 1995, skiing numbers remained constant while snowboarding injuries reduced, matching their participation proportion. These numbers originally showed a male oriented injury pattern but levelled off to match injury rates to participation rates. Types of injuries between skiers and snowboarders were also looked at in this study. Table 4 shows snowboarders to be much more at risk of wrist injuries while skiers tend to have knee injuries more often. Other injuries did not significantly differ from skiers or snowboarders in this study but Geddes and Irish (2005) found different results.

In their study, Geddes and Irish (2005), it was found that snowboarders are much more likely to be young men who are performing jumps or who fall while on the slopes. This study also found that 98% of injured snowboarders were male, and 77% of injured skiers were male. This shows data inconsistent with that of Sutherland et al., with injuries rates overcoming participation rates by a large amount. They also found that 66% of the splenic injuries were received by

snowboarders though they only account for 10-30% of on slope participants (Geddes and Irish, 2005).

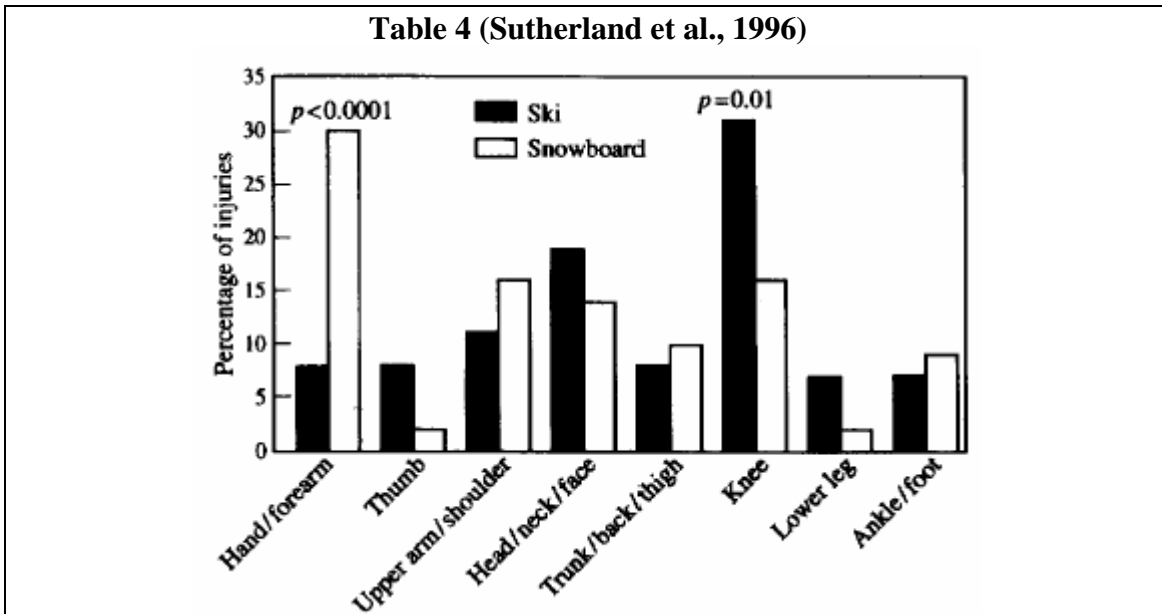
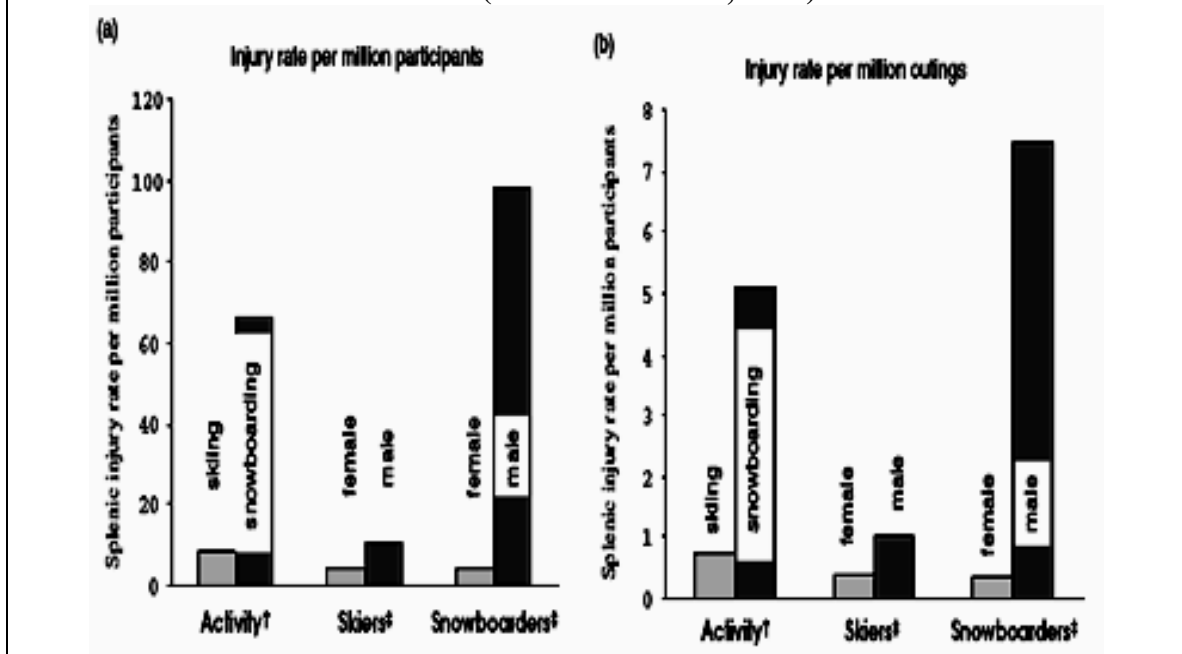


Table 5 represents this data very adequately. Idzikowski et al., however, found that snowboarding injuries were in-line with participation ratios: “For 7415 injuries, the sex of the person was known; 74.1% of injuries (5494) occurred in men and 25.9% (1921) in women” (2000). Again, this study found the wrist to be the most often injured area: “The most common site of injury was the wrist (21.6% of all snowboarding injuries). Wrist fractures (except to the scaphoid) and sprains were more common in beginners, women, and younger age groups” (Ibid). We can see that females were more likely to injure their wrist but more males had injured wrists as more males participate in snowboarding.

Table 5 (Geddes and Irish, 2005).



Skiing’s most common injury is to the knee (Sutherland et al., 1996). Loes et al. found that females were much more prone to knee injuries than were men at a 2.5 to 1 ratio (Loes et al., 2000). They concluded that: “Although females had higher incidences of knee injuries than males in nine sports, the overall incidence was significantly higher in males” (Ibid). Even though females were more commonly injured in relation to participation, males had more incidences as they participate in higher numbers. Gerritsen, KGM et al. discovered that “Injuries to soft tissue structures at the knee joint account for more than 20% of all injuries to recreational skiers” (2002). Radmayer et al. found that: “35% (91 of 254) of injuries [at one clinic] were from skiing accidents and the majority of renal injuries (76.8%) occurred in male patients” (2002). Once again it is shown that males are disproportionately injured while skiing (should be 68%).

The study by Prall et al. found evidence that males in both skiing and snowboarding were more likely (than participation proportion would suggest) to sustain injury than females. This study found that snowboarders were 4.4 times more likely, and

skiers were 2.6 times more likely to sustain an injury (Prall et al., 1995). If we assume 70% of boarders and 68% of skiers are male (Geddes and Irish, 2005), then we could expect a male to female injury ratio of 2.3 for snowboarders and 2.1 for skiers. While studying head and spinal injuries, Siu et al. found similar results to that of Prall et al.: in that a male to female injury ratio of 2.3 and 2.5 existed for skiers and snowboarders respectively (Siu et al., 2004). In comparing the studies it would seem that male snowboarders are more at risk to injury, than male skiers in proportion to male to female participant ratios. The study conducted by Floyd regarding spinal trauma found that male skiers and snowboarders (the groups were not separated) were 2.4 times more likely to be injured than were females. Shorter et al found that in their group of 27 injured snowboarders, all but one was male (Shorter et al., 1999). All these studies show males to be disproportionately injured while skiing or snowboarding.

In terms of safety of participants of skiing and snowboarding there are many studies that give contradictory conclusions. Some say skiing is safer and injuries are reducing, while others say snowboarding is safer and injuries are becoming more numerous. Floyd says: “The incidence of spinal trauma with death or neurologic sequelae – about one per two million skier-days – is extremely low. Alpine skiing and snowboarding are safe activities with respect to significant spinal trauma, and seem to be getting safer” (2001). But when the data of Siu et al. is reviewed it can be seen that they conclude the complete opposite: “Unfortunately, this surge of popularity has been accompanied by an increasing incidence of snowboarding trauma, notably head and spinal injuries” (2004).

There is also a difference of opinion whether or no injuries are increasing or decreasing. As noted above, Siu et al. found that head and spinal injuries are increasing, but continue to say “A general reduction in the injury rate of snow sports has also been reported in North America, Europe, Japan and Australia” (Ibid). Ferrera et al. show snowboarding accidents are increasing but do not compare the data to the increase in snowboarder numbers: “The number of injuries per winter season has been steadily increasing, with 1 patient in the 1993 to 1994 season, 5 in 1994 to 1995, 6 in 1995 to 1996, 13 in 1996 to 1997, and 46 during the 1997 to 1998 season” (Ferrera et al., 1999). Ferrera et al. agree with injury patterns between skiers and snowboarders noting that snowboarders receive more wrist and arm injuries while skiers receive more knee injuries. The paper continues by saying snowboarding may be safer as there are less serious injuries: “Deaths due to snowboarding trauma are very rare, and we found no deaths in our study population” (Ibid). Shorter et al. echo these findings as they are commenting on the relative safety of snowboarding, though they do not make definitive conclusions, they show where their opinions are laying:

Although a few snowboarding deaths have been reported and serious injuries do, rarely, occur, we are not yet seeing the type of severe multiple-system trauma that is being seen increasingly frequently in skiing...It is too early yet to conclude that snowboarding is safer than skiing, with less potential for life-threatening injury” (1999).

Daniel Fulham O’Neill and Mark R. McGlone present some rather interesting evidence in their study on injury patterns on first time skiers and snowboarders. This study found that injury rates among the two groups to be equal, with 4% of participants in both sports receiving injuries (O’Neill and McGlone, 1999). They also found that snowboarding presented more emergent injuries (injuries necessitating immediate intervention) than skiing did (table 6). The authors also present evidence that snowboards injuries are

Table 6 (O'Neill and McGlone, 1999)

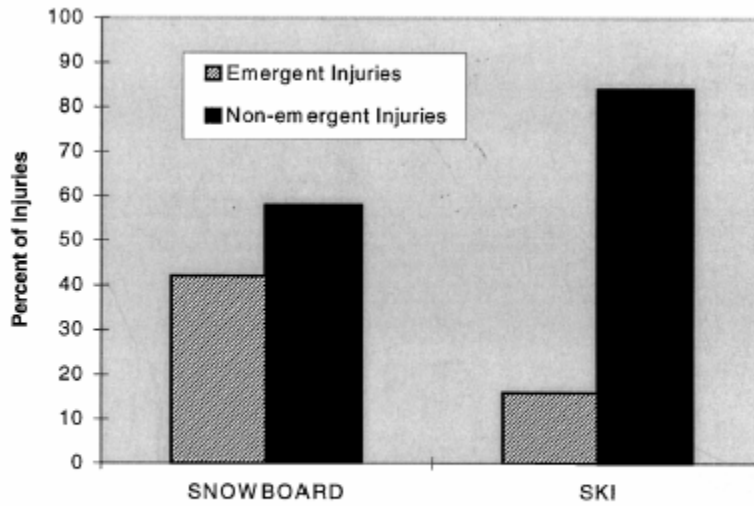


Figure 3. Emergent versus nonemergent injuries in first-time snowboarders and skiers.

increasing: “Statistics from the U.S. Consumer Product Safety Commission showed a 42% increase in snowboarding accidents between the years 1993 and 1994”, and that head injuries are more common in snowboarders than skiers (Ibid). They make the conclusion that: “snowboarding does show a higher incidence of emergent injuries” (Ibid). Hennessey et al. has the same findings: “recent studies suggested a higher incidence and severity of traumatic brain injury in snowboarding” (2002). In their study Gerritsen, et al. found that severe knee sprains are increasing at a significant rate over the last 18 years in skiers and that “[injury occurs] predominantly during the landing phase following a jump” (1996). With more youths jumping in terrain parks in recent years, injuries of this kind will continue to increase.

It is difficult to look at all the research that has been done and decide one way or another which of the two sports is safer, but as more information comes to light it seems more and more emergent injuries are occurring in snowboarding. It is also difficult to conclude if injury rates are rising at par with participation rates or above them. The data

indicates head, knee, wrist, and spinal injuries are increasing but some research indicates overall rates are decreasing.

Many of the already referenced studies include ideas for reduction and prevention of injuries; there have also been many studies dedicated to this topic. O'Neill and McGlone seem to understand the dynamics of snowboarding. They properly discuss why snowboarders receive more upper body injuries than skiers do:

“Because both feet are locked onto a snowboard, when the snowboarder falls backward, his or her head can be slapped against the surface of the snow. When the snowboarder falls forward, the wrists and arms take the bulk of the trauma, which accounts for the higher incidence of upper extremity injury in snowboarding (53% compared with 21% in skiing)” (1999).

These authors, along with many others promote the use of helmets to reduce head injuries (O'Neill and McGlone 1999, Siu et al., 2004, Hennessey, T. et al., 2002). Shorter et al. show that none of the children who had received injuries while snowboarding were wearing a helmet (1999). Surely if the children had taken the advice of these researchers, they would not have received as many head and neck injuries.

Idzikowski et al.'s study found that: “Snowboarders who wore protective wrist guards were half as likely to sustain wrist injuries as those who did not wear guards” (2000). This is certainly important information as wrist guards seem to provide a way to reduce the most common injury in snowboarding.

The final bit of research that will be discussed here are the findings of Jørgensenn, et al. This study split up skiers into two groups: one group who had watched a 15 minute video about skiing safety, and another group who had not watched the video. The research found that: “Of all the skiers in the study injuries were seen in 16% (39/243) of the skiers in the video group versus 23% (119/520) in the control” (2002). Something as

simple as watching a video to teach you some of skiing's safety basics was able to reduce the injury rate by 7%.

Observations I have made while working in terrain parks (former snowboard parks) and as a participant in both of these two leisure time recreational activities would support most of the research. There is definitely a male domination in both these sports. In the terrain park in particular, male to female ratios of those entering the park is at least 9 to 1. From what I observed, males were more drawn into the park, an area of high risk, to compete with friends attempting to get the biggest air in the half-pipe, slide the hardest rail, or do the best trick off of a jump. Female riders rarely require ski patrol services as they seem to stay within their comfort zone while in the park progressing one step at a time. Most males just get into the park and immediately try to do the hardest trick possible. Whether or not this is to impress friends or to simply try and reach their optimal stimulation, it ends up in injury more often than the 9 to 1 (male to female) terrain park participation ratio. I personally dealt with injured skier and snowboarders with most injuries occurring in young, male, unhelmeted riders, who have received head injuries, usually combined with broken wrists (snowboarders) or injured knees (skiers).

Before controls were put in to ensure safety, people were being injured quite often, and quite seriously. A park pass system has been implemented that requires all those who wish to enter the terrain park to watch a video (similar to the video in the Jørgensenn, et al study). I have noticed a decline in major injuries due to this video, which stresses awareness, smart personal judgement, and the use of safety equipment such as helmets. Overall injury rates have declined over the past 4 years when related to increasing participation numbers (Whitall, 2005).

At High North Ski Camp, in the summer of 2005, there were 5 girls (total) over the 3 sessions; during which time, 180 males participated at the camp. This 36 to 1, male to female ratio shows the male dominance in extreme skiing. Injuries, however, occurred approximately equally between the two sexes, and were above the usual injury rate of 4% found in O'Neill and McGlone. Injury rates at the camp were about 20% of participants. This could indicate that all campers felt an urge to push themselves and could also indicate that the females in the camp were more motivated to impress the males, so they could fit into this male dominated sport. Here the idea of sex based diffusion could be considered. The females, trying to reach the status of males in skiing push themselves harder to be accepted; the female injury rate at the camp was 10 times higher than participation rates. The drive to push oneself and impress will lead to more injuries and the high female injury rate can be explained by the drive to be accepted.

Conclusions

The above data shows that snowboarders and skiers are predominantly youthful males. It is also seen that male participants in these sports are at a higher risk of injury than females in proportion to participation ratios (male to female). It is seen that injuries can be reduced by the use of helmets and wrist guards, through access control of high risk areas, or through watching educational videos. The precise reasons for the high injury rates for males are not entirely certain. When we look at Gilbert and Hudson's findings in relation to Slanger and Rudestam's, conclusions could be drawn that males believe they can handle risk better so they take more risks. The need to show how manly a subject is and avoid "anxieties about masculine inadequacy, that is to say, castration fear" (Rudestam, and Slanger, 1997) appears to be as important as generating the maximum

stimulation; in regards to receiving injuries. The aspect of fear that females have shown (Gilbert and Hudson) looks to be a large factor in reducing their injuries. The 'fearless', 'macho' male participant is at a much higher risk of injury than females.

All available data seems to indicate a reduction in overall injury rates with severe injuries increasing. There is no marked discrepancy between skiing and snowboarding injury rates (4% of participants according to O'Neill and McGlone) but injury patterns between the two sports are different. Hand and wrist injuries are the most popular snowboarding injury while knee injuries affect skiers more often. The two sports are equally safe with the male participants at greater risk.

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