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Incidence of concussion over five seasons in a ski resort in Japan

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Background

Concussion

A brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces

Consensus Statement on Concussion in Sport—
The 4th International Conference on Concussion in Sport
Held in Zurich, November 2012

International Conference on Concussion in Sports

➤ Participating association

International Olympic Committee (IOC)

Fédération Internationale de Football Association (FIFA)

International Rugby Board (IRB)

International Ice Hockey Federation (IIHF)

➤ Past Conference

1st Vienna (2001) 2nd Plague (2004)

3rd Zurich (2008) 4th Zurich (2012)

➤ Consensus Statement on Concussion in Sport

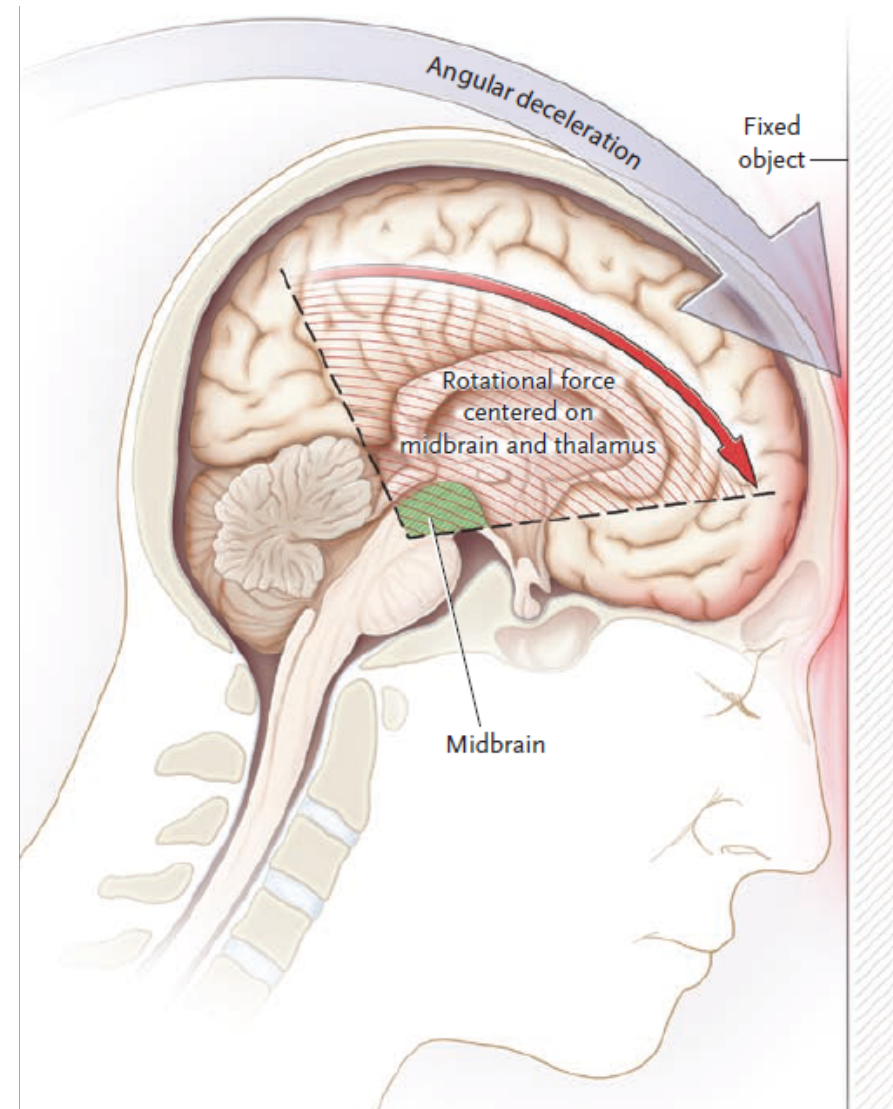
Mechanism of Concussion

Linear and rotational acceleration of head cause concussion

Cause of concussion In case of winter sports

Collisions with trees or with other skiers/snowboarders

Bridges et al. 2003



Allan HR, et al. 2007

Type of traumatic brain injury

Severity of traumatic brain injury			
	<u>GCS</u> Glasgow Coma Scale	<u>PTA</u> post-traumatic amnesia	<u>LOC</u> Loss of consciousness
Mild	13–15	<1 day	0–30 minutes
Moderate	9–12	>1 to <7 days	>30 min to < 24 hours
Severe	3–8	>7 days	>24 hours

"Traumatic Brain Injury Task Force".(2008)

<http://www.cdc.gov/nchs/data/icd9/Sep08TBI.pdf>

Symptoms

- Postconcussive Syndrome (may continue for weeks, months, or a year or more after a concussion)

Physical

headache, dizziness, sensitivity to light or noise, fatigue, Balance deficit ,etc. . .

Psychological and behavioral

irritability, anxiety, depression, change in personality, etc. . .

Higher mental functions

Problem of cognition, attention, memory

- Second Impact Syndrome

A rare, often fatal, traumatic brain injury that occurs when a repeat injury is sustained before symptoms of a previous head injury have resolved.

Research question

What is main causes and risk factors of concussion during winter sports especially in Japan?

To prevent concussions on the spot

number of skiers/snowboarders suffering subsequent symptoms and/or some deficits of physical function



Aim

To investigate the incidence of **concussion** in a ski resort in Japan and to identify risk factors of concussion from data obtained regarding injuries

- Data

Injury reports of Mizuho Ski Resort nearby Hiroshima



Method – Data collection-

- Collecting term : 2007-2011 season (5 seasons)
- Analysis objects: Injuries treated by a ski rescue team at the ski resort

Analyzed items

- Date of injury
- Characteristics of injured guests : Age, gender
- Equipment : Ski or Snowboard
- Mechanism


Results

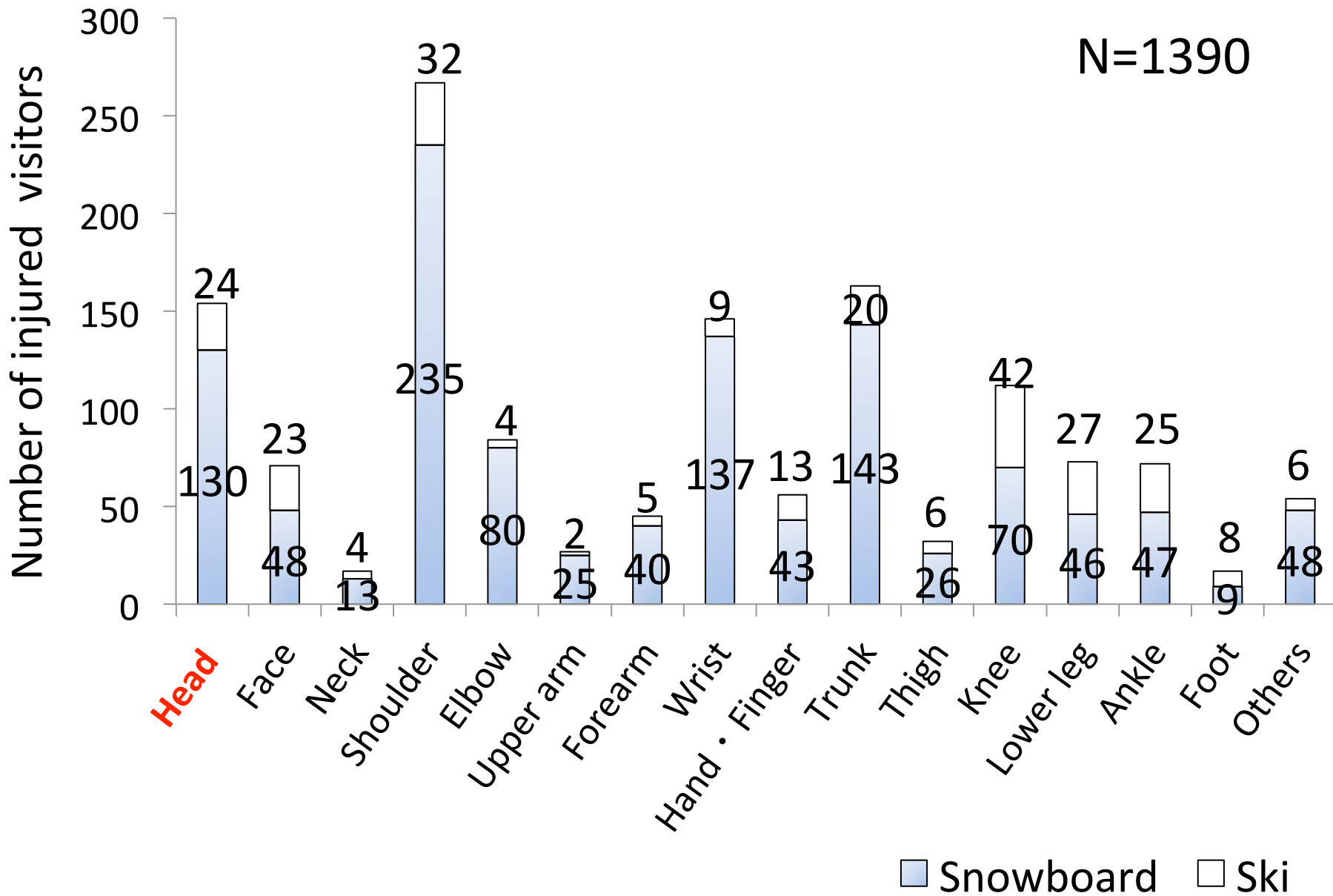
Number of injuries

Year	2007	2008	2009	2010	2011	Total	Average
Number of injuries	270	255	318	311	206	1390	278

Distribution of all guests, and the injured

	Ski	Snowboard
All guests (%)	35	65
Injured guests(%)	18	82
Incidence (per 100,000 skiers/snowboarders)	43.5	56.7



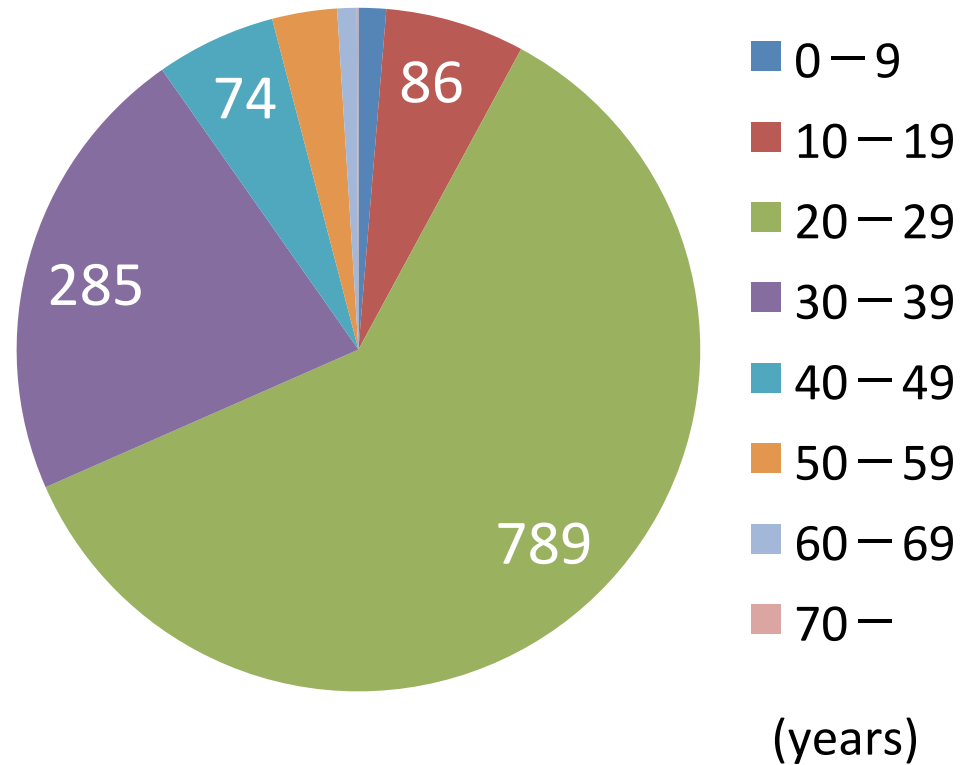
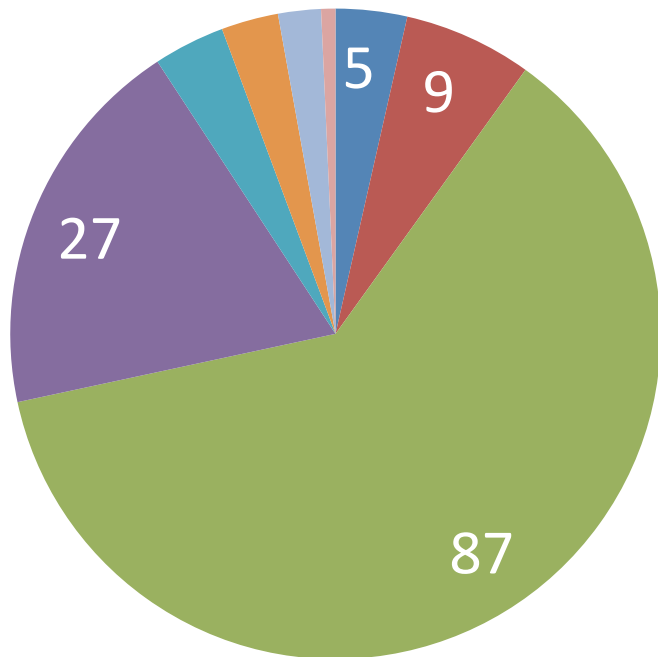


Distribution of injuries occurred in from 2007 to 2011 season

Age distribution of injured guests

Head injuries N=154

Overall N=1390



- 0-9
 - 10-19
 - 20-29
 - 30-39
 - 40-49
 - 50-59
 - 60-69
 - 70-
- (years)

Type of head injuries

	Ski	Snowboard	Total
laceration	9	92	101
bruise	15	35	50
others	0	3	3
Total	24	130	154

4 injuries in snowboards was recorded
as **concussion**

Situation in which concussion occurred

Case	Date	Age	Gender	Equipment	Use of helmet	Mechanism
1	19 th Dec.	28	F	Snowboard	No	Loss of balance
2	28 th Dec.	22	F	Snowboard	No	Collision with other snowboarder
3	17 th Jan.	31	M	Snowboard	No	Collision with other snowboarder
4	3 rd Jan.	30	F	snowboard	No	Failure in Jumping

Discussion

- Only **0.3%** (4/1390) accounted for concussions

Possibility:

concealed cases by snowboarders
overlooked by staff of ski rescues
due to difficulty of diagnose

- All injured person **didn't** wear a helmet

Playing winter sports without a helmet may be a high risk factor of concussion

- All concussion occurred in early on the season (from December to January)

Most head injuries occurred early on the season
(Levy, et al. 2002)

Players Not accustomed with ski/snowboard

- All concussion occurred in snowboarders

The result was controversial to previous studies
⇒ necessity of further investigation

Review of articles

-Benefits and risks of helmet use-

Benefits

- Mitigate (linear and rotational) acceleration of head against direct impact
- Reduce risk of head injuries by 15-60 %

Macnab AJ et al. 2002

Hagel BE et al. 2005

Sulheim S. et al. 2006

Mueller BA et al. 2008

Risks

- Risk taking behavior
 - excessive confidence
 - uncontrollable high speed
- Increase risk of cervical injury

Benson BW et al. 2009

Current problem and countermeasure

- Low rate of helmet use of skiers and snowboarders
- Difficulties in catching presence of concussion



Education and Campaign

GET A HEADS UP ON SKI HELMET SAFETY

START WITH THE RIGHT SIZE:

BRING THE SKIER
Bring your child or teen with you when buying a new helmet to make sure that you can check for a good fit.

HEAD SIZE
To find out the size of your child's or teen's head, wrap a soft tape measure around his or her head, just above their eyebrows and ears. Make sure the tape measure stays level from front to back. (If you don't have a soft tape measure, you can use a string and then measure it against a ruler.)

SIZES WILL VARY
Helmet sizes often will vary from brand-to-brand and with different models. Each helmet will fit differently, so it is important to check out the manufacturer's website for the helmet brand's fit instructions and sizing charts, as well as to find out what helmet size fits your child's or teen's head size.

GET A GOOD FIT:

GENERAL FIT
A ski helmet should fit snugly all around, with no spaces between the foam or padding and the snowboarder's head.

ASK
Ask your child or teen how the helmet feels on their head. While it needs to have a snug fit, a helmet that is too tight can cause headaches.

HAIRSTYLE
Your child or teen should try on the helmet with the hairstyle he or she will wear while skiing. Helmet fit can change if your child's or teen's hairstyle changes. For example, a long-haired skier who gets a very short haircut may need to adjust the fit of the helmet.

COVERAGE
A ski helmet should not sit too high or low on their head. To check, make sure the helmet sits low enough in the front to protect the skier's forehead, about 1 inch above the eyebrows, and the back of the helmet does not touch the top of the skier's neck.

ADJUSTMENTS
Some ski helmets have removable padding that can be adjusted to get a good fit.

GOGGLES
Have your child or teen try on the helmet with the goggles they will wear on the slopes. The helmet should fit snugly on top of the goggles, with no space between the helmet and the top of the goggles. However, the helmet should not sit so low on the snowboarder's head that it pushes down on the goggles.

VISION
Make sure that the skier can see straight forward and side-to-side.

CHIN STRAPS
The chin strap should be centered under the skier's chin and fit snugly, so that no more than one or two fingers fit between the chin and the strap. Tell your child or teen to open their mouth wide...big yawn! The helmet should pull down on their head. If not, the chin strap needs to be tighter. Once the chin strap is fastened, the helmet should not move in any direction, back-to-front or side-to-side.

While there is no concussion-proof helmet, a ski helmet can help protect your child or teen from a serious brain or head injury. The information in this handout will help you learn what to look for and what to avoid when picking out a helmet for your child or teen.

HEADS UP CONCUSSION

Conclusion

1. Snowboarding without helmets and early period of winter sports season are supposed to be risk factors of onset of concussion
2. Use of a helmet is one of possible strategy in reducing concussion
3. Education and campaign for guests at ski resorts to use helmets may be effective for prevention of concussion and subsequent symptoms