Sports injuries in winter sports in Japan

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Sapporo Medical University, Japan
Ski/Snowboard injury

Data of The Japan Association for Skiing Safety

Snowboard injury: 1.7 times higher than ski injury
Training facilities for Olympic athletes

The National Training Center (NTC)

Track and Field

Located in Tokyo

Indoor Training Center

Indoor Tennis Courts

Athletes’ Village
NTC indoor training center

- Gymnastics
- Volleyball
- Basketball
- Handball
- Badminton
- Table tennis
- Shared gymnasium
- Swimming pool
- Judo
- Wrestling
- Boxing
- Weightlifting

No winter sports facilities
NTCs for winter sports

Placed in local winter sports facilities.

- Sapporo
  - Ski jumping
  - Biathlon
- Sapporo
  - Speed skating
  - Ice hockey
- Tokyo
  - Bobsled/Luge
  - Nordic combined
  - Speed skating
  - Short track speed skating
  - Curing

Figure skating

 placed in local winter sports facilities.
Ski jumping

- High-velocity (90km/hr or more)
- Flight distance (K point: Normal hill 90m, Large hill 120m, Flying > 180m)

⇒ potentially dangerous

Insufficient data on ski jumping injuries (especially females)
Activities in NTC for ski jumping athletes in Sapporo

- Training
- Medical
- Science
- Nutrition

Surveillance of ski jumping injuries is needed!

Winter Olympic game was held in 1972 in Sapporo.
Materials and Methods

Athletes of ski jumping

- **Duration**: 2008～2013
- **Number**: Male 51, total 118
  Female 22, total 53

Okurayama ski jump stadium in Sapporo

National training center of ski jumping in Japan
Medical check-up

- Questionnaire survey: Past history, Current symptom...
- Orthopaedic surgeon: Physical examination, Diagnosis

- Physician
- Nutritionist

Basic training support by NTC trainers
Evaluation

- Past history of sports injuries
- Current symptoms, Diagnosis
- Problem status (3 grade: active, follow, inactive)

Compared between males and females
Chi-square test ($p < 0.05$)
Results
Past history of sports injuries

Male
28/51 (54.9%)

Female
14/22 (63.6%)

N.S.

Past history of sports injuries in males and females is shown in the pie charts. The injuries are categorized as:
- Lumbago
- Knee pain
- Ankle sprain
- Fracture
- Head injury

For males:
- Lumbago: 11
- Knee pain: 13
- Ankle sprain: 5
- Fracture: 6
- Head injury: 3

For females:
- Lumbago: 6
- Knee pain: 16
- Ankle sprain: 2
- Fracture: 7
- Head injury: 4

Head injury and other injuries are shown separately in the charts.
<table>
<thead>
<tr>
<th>Past history (detail)</th>
<th>Male (28)</th>
<th>Female (14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee pain</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>(MCL3, <strong>ACL3</strong>, Osgood–Schlatter3, bipartite patella)</td>
<td></td>
<td>(ACL7, meniscus3, MCL2, LCL1)</td>
</tr>
<tr>
<td>Lumbago</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>(spondylolysis 3, disc herniation 1)</td>
<td></td>
<td>(disc herniation2, bruise1)</td>
</tr>
<tr>
<td>Ankle sprain</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Head injury</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>(fracture1, <strong>concussion1</strong>, bruise1)</td>
<td></td>
<td>(<strong>concussion6</strong>, bruise2, cut1)</td>
</tr>
<tr>
<td>Other fractures</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>(shank3, clavicle1, forarm1, wrist1, ankle1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck injury</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>(sprain1)</td>
<td></td>
<td>(spine injury2, sprain2)</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

42 locations = 1.5/person  44 locations = 3.1/person
## Current symptom

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons</td>
<td>46/118 persons (39%)</td>
<td>33/53 persons (62%)</td>
</tr>
</tbody>
</table>

**Significant difference** ($p < 0.01$)
Current symptom (detail)

Male 46/118 persons (39%)

<K<Diagnosis>

- Lumbar 11
- Myogenic 9
- Disc herniation 1
- Spondylolysis 1
- Knee disorder 8
- Patella tendinitis 4
- Plica syndrome 1
- Iliotibial band syndrome 1
- Osgood-Schlatter disease 1
- Pes antherinus syndrome 1
- Knee trauma 3
- ACL injury 2
- MCL injury 1
- Ankle injury 8
- Chronic lateral ligament injury 3
- Acute lateral ligament injury 3
- Medical ligament injury 1
- Lateral malleolus fracture 1
- Neck injury 1
- Cervical sprain 1

Others 11
Neck pain 3
Thigh/lower leg pain 4
Ankle/foot pain 8
Lumbago 15
Knee pain 16
Current symptom (detail)

Female 33/53 persons (62%)

Lumbago 13
Knee pain instability 11
Ankle/foot pain 4
Thigh/lower leg pain 3
Others 4
Neck pain 4

Diagnosis:

Lumbar 8
Myogenic 6
Disc herniation 2
Lumbar bruise 1
Knee disorder 3
Extensor mechanism 1
Pes antherinus syndrome 1
Patellofemoral 1
Knee trauma 4
ACL injury 2
MCL injury 2
Ankle injury 3
Lateral ligament injury 2
Syndesmosis injury 1
Neck injury 3
Cervical sprain 2
Healed cervical spine fracture 1
## Problem status

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>F</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>5.1%</td>
<td>36.4%</td>
<td>58.5%</td>
</tr>
<tr>
<td>51</td>
<td>(total 118)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>7.5</td>
<td>41.5</td>
<td>50.9</td>
</tr>
<tr>
<td>22</td>
<td>(total 53)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**A**: Active (examination/treatment needed)

**F**: Follow (follow-up needed)

**I**: Inactive (no problems)
Discussion
Injuries in ski jumping

133 of 286 (46.5%) injury questionnaires. Mean age: 25.3 years (9-64)

- 60.9% had been injured to require examination by a physician at least once.

- Injury risk: 9.4 per 100 skier-years
  - Types: Fracture 22%, Sprain 14%, Dislocation 13%, Concussion 8.5%
  - Location: Shoulder 17.5%, Head 12%, Ankle 11%, Knee 10%, Clavicle 7%, Face 6.5%
  - Fracture site: Upper extremity 60.9%, Lower extremity 26.1%, Axial 13%
Injuries in ski jumping

Permanent medical disability
- 2,200 jumpers (1977–81): 12 (Cervical spine injury 4, Loss of one eye 1, Head injury 1, Leg amputation 2, Fracture 4)
- 2,600 jumpers (1982–86): 3 (Loss of one eye 1, Head injury 2)

Large hill: 2,382, Normal hill: 1,773
- Frequency of fall-down: Large hill 8.29‰, Normal hill 10.16‰
- 43 of 71 jumpers following fall-down: 25 Injuries
  Bruise 42%, Sprain 28%, Concussion 12%, Abrasion 9%, Fracture 7%, Nosebleed 2%
- Location: Face/head/neck 51%, Upper extremity 21%, Lumbar/lower extremity 21%, Others 7%

• Cause: Fall-down
• Permanent disability possible
• No data about female jumpers
## Our data

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>History of injury</strong></td>
<td>26/51 jumpers (51%)</td>
<td>14/22 jumpers (63.6%)</td>
</tr>
<tr>
<td>Knee injury</td>
<td>ACL:3</td>
<td>ACL:7</td>
</tr>
<tr>
<td>Concussion</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Cervical injury</td>
<td>Sprain:1</td>
<td>Spine injury:2, Sprain:2</td>
</tr>
<tr>
<td><strong>Current symptom</strong></td>
<td>46/total 118 jumpers (39%)</td>
<td>33/total 53 jumpers (62%)</td>
</tr>
</tbody>
</table>

**Female jumper: significantly higher rate**

Knee injury (ACL), Concussion, Cervical spine injury

Current symptom
Future direction

- **Surveillance & Follow-up System**
  Medical committee in Ski Association of Japan
  (Immediate reports system)

- **Prevention of sports injury in ski jumping**
  - Female athletes
  - Mechanism of knee injuries (ACL injury)
  - Training for injury prevention

- **Emergency care**
  - Head injury
  - Spine injury

Alpensia Ski Jumping Stadium