Subject Index

A
Abdominal trauma, 288–296
Accidents, peak hours of occurrence, 280–287
Achilles tendon injuries, 83–84
Age of ski binding
and safe release, 174–175
Age of skier
and binding adjustment systems, 184–185, 188–201
Alpine release bindings, see Release bindings
Ankle joint
action in forward falls, 81–84
bend in ski boots, 128
sprains, 114, 285–286
Anterior cruciate ligament, see Ligaments, anterior cruciate
Anthropometric dummy
testing of binding-boot system, 225–232, 226 (illustration)
Autoregressive moving average exogenous (ARMAX) models, 5–25
knee rotation, 13 (table), 16, 20, 21
Arthroscopy
knee joint, 56, 62, 65
ASTM Committees
  F-8, Sports Equipment and Facilities, 1
  F8.14, 1
  F-27, Snow Skiing, 1, 121, 218
ASTM Standard
F 504: 120, 203, 209, 215
Athletic injuries, see Skiing injuries
Atrophy, muscle, 73
Avulsion fracture, knee, 69

B
Bacteria
in anorectal abscess, 308–309
Bending fractures, tibia, 114–116
BFU, see The Swiss Association for Accident Prevention
Binding release torques
accuracy of setting, 169–179, 187
comparison BFU and IAS recommendations, 180–187
comparison ISO and DIN recommendations, 202–211

C
Citation

History of measurement, 218–219
test devices for, 217–224
Biomechanics
  cross-country skiing, 107 (table), 108 (illustration)
  heel of ski bindings, 79–85
  knee joint in alpine skiing, 5–54, injuries, 69–72, 74 (illustration)
Body height
and binding adjustment systems, 183, 203–204, 204 (table)
Body weight
and binding adjustment systems, 183, 203–204, 204 (table)
effect on knee rotation, 10–13, 13 (table)
Boot/bindings systems
for children, 212–214
Geze, 225–232
Nava, 225–231
testing of, 202–216, 225–232
Boot sole
dirt buildup,
effect on binding performance, 189–190, 198–199, 201, 214
length,
effect on binding performance, 192, 208, 215
material,
effect on binding performance, 190–201
Boot top fracture, 115–116
Boots
and anterior cruciate ligament injury, 55–60, 61–65
for children, 188–201
cross-country, 102, 105
design improvements, 113–114, 123–126, 127, 226–331
flexibility versus temperature change, 134–144
flexible type, 226
and foot compression syndrome, 145–153
force deflection curve test, 120
fractures related to, 113–126
hysteresis curves for, 127–144
measuring of, 154–165
specifications, 113–126, 128, 138, 164, 214
stiffness of, 120–126, 135–143, 154–165
thermoplastic rubber, 190–201, 214

C
Carpometacarpal joint
injury of, 299–306
Cervical spinal cord
injury of, 314–319
Children
boot/binding systems for, 188–201, 212–224
Competitive skiing,
safety rules, 331–332
ski binding release, 169–179
Compression syndromes
related to ski boot fit, 145–153, 153 (table)
Computers See also Microprocessors
use in ARMAX modeling, 10
use in binding adjustment, 221
use in boot size measurements, 115
Cross-country skiing
equipment, 100–109
trauma, 100–109

D
DIN, see German Industrial Standard
Dislocations, 272–274
thumb, 299–306
Dynamometers
Interfacing with microcomputers, 239, 247, 249–256
pedestal type, 8–10, 29–33
shear panel element type, 9–10

E
Economy
and ski injuries, 295
Electrogoniometers, 29
Electrogoniography
biceps femoralis muscle, 28, 59
gastrocnemius muscle, 80–84
gluteus maximus muscle, 80, 83
knee joint musculature, 28–52
rectus femoris muscle, 28, 80, 83
semitendinosus muscle, 28
tibialis anterior muscle, 80, 83
vastus lateralis muscle, 28, 59
vastus medialis muscle, 28
Electronic release ski bindings, 235–259
EMG, see Electromyography

F
Falls, backward, 275
and anorectal abscess, 310, 313
and knee injury, 55–60
Falls, forward, 275
motion analysis of, 79–85
and release binding performance, 80–85, 190, 195, 196, 200, 278
Fibula
fractures of, 275–276, 277 (table)
First aid treatment, 323–325
FIS, see International Skiing Federation
Fistula, anorectal, 307–313
Foot moment-knee rotation data, 5–25
Fractures
boot top, 115–116
fibula, 275–276, 277 (table)
related to ski boots, 113–126, 267, 268
tibia, 114–116, 275–276, 277 (table), 279

G
Gastrocnemius muscle
activity in forward falls, 82–84
electromyography of, 80–84
German Industrial Standards (DIN)
DIN 7881: Ski Bindings-Setting Table for
Release Values, 207, 217–219, 268
DIN 7881 3–5: Release Binding for Alpine
Downhill Skiing for Children, 212–216
DIN 32921: Test Devices for Adjustment of
Functional Unit Ski/Binding/Brake/
Boot, 217–224
Geze boot-binding system, 225–232
Graft reconstruction, knee ligaments, 69, 70
(illustration)

H
Hamstring muscle group
in backward falls, 60
electromyography of, 28–29, 58
in knee hyperflexion, 63
Heel release, see also Release bindings
in forward falls, 80–85
Helicopter
use in rescue of injured skiers, 323–325
Hip contusion, 307–313
Hospitalization
length of for skiing injuries, 295
(illustration)
Hysteresis curves
boot flexibility, 127–144

I
IAS, see International Association for Safety
in Skiing
In-boot fractures, 113–126
Injuries, skiing
epidemiology of, 263–296, 266 (table)
factors contributing to,
age/sex of skier, 121, 264, 269, 272–274, 274 (illustration), 277 (table), 289–291
boot stiffness, 120–125
inclination of slope, 275
number of skiers on slopes, 281, 285
skiing experience, 290–291
snow conditions, 275, 281–287
temperature, 281–287
time of day, 280–287
rate of, 113
statistical classification, 265–270, 266 (table), 308 (table)
treatment,
anorectal abscess, 310–312
costs, 295
First aid, 323–325
surgery, knee, 69–73
surgery, tarsal tunnel syndrome, 149–150
thumb injuries, 299–306
types,
abdominal trauma, 288–296
Achilles tendon, 83–84
anorectal abscess, 307–313
carpometacarpal joint dislocation, 299–306
cervical spinal cord, 314–319
fibula fractures, 275–276
foot compression, 145–153
hip contusion, 307–313
in-boot fractures, 113–126
kidney lesions, 291–295
knee ligament tears, 5–76, 268, 276
tibia fractures, 69, 114–116, 275–276, 277 (table), 279
torso trauma, 288–296, 293 (illustration)
urogenital lesions, 291–295, 294 (illustration)
Injury thresholds
for child skiers, 216
International Association for Safety in Skiing (IAS)
binding adjustment systems, 180–187, 218
International Skiing Federation (FIS), 1, 329–332
International Society of Skiing Safety (ISSS), 1–2, 213
International Standards Organization (ISI)
Alpine Ski Bindings
DP 8061: Method for Selection of Release Torque Values, 202
Japan, ski accidents, 271–287
Joints, see Ankle joint; Carpometacarpal joint; Knee joint
Kidney lesions, 291–295
Kirschner wire fixation
thumb injuries, 303–304
knee joint, See also Ligaments, knee
anatomy of, 28–29, 29 (illustration), 57 (illustration)
bio mechanics of, 1–54
injuries, 55–75
hyperflexion,
and anterior cruciate ligament rupture, 61–76
injuries, 5–75, 268, 276
mechanism of, 5–25, 55–67, 56 (table)
meniscus lesions, 55–75
rotations, see Rotations, knee joint
sprains of, 265, 268, 276
stiffness, 26–52
relationship to contracting musculature, 48 (table)
L
Lacerations, 267–268, 272–274
Lachman’s sign, 62, 65, 69, 71
L-A-S correction factor, 204
Lateral toe release torques, see Binding release torques
LEERI (lower extremity equipment related injuries), 268
Ligaments, knee
anterior cruciate,
chronic insufficiency of, 68, 71–72, 74
injury, 55–76
acute vs chronic, 74–75
reconstruction of, 68–76 70 (illustration), 71 (illus)
medial collateral, 68, 73, 276
Lip numbers and release binding adjustment, 218
M
Mathematical modeling
auto regressive moving average exogenous (ARMAX) models, 5–25
backward fall, skiing, 56
knee joint rotations, 5–25
Medical organizations, 331
Meniscus lesions, 55–75
Method for Measuring Release Moments of Adult Alpine Ski Bindings
ASTM Standard F 504:203
Microcomputers, see Microprocessors
Microprocessors
for ski binding release, 235–248
test devices for ski binding, 221
Motion analysis laboratory, 79–85
Muscle atrophy, 73
Muscle groups
and laxity/stiffness of knee joint, 26–52, 33, 34, 48 (tables)
Muscles, see Electromyography;
Gastrocnemius muscle; Hamstring muscle group; Quadriceps muscle group; Triceps surae muscle
N
Nava boot/binding system, 225–232
Nerves
ski boot compression syndrome, 149, 153
Neuritis
related to ski boot fit, 145–153
O
Organizations, see International Association for Safety in Skiing; International Skiing Federation; International Society of Skiing Safety; International Standards Organization; Swiss Association for Accident Prevention
P
Pain threshold
for knee torsion, 49–50
Peroneal nerve
in ski boot compression syndrome, 149
Posterior tibial nerve
in ski boot compression syndrome, 153
Pressure distribution
ski boot on lower leg, 154–165
Q
Quadriceps muscle group
effect on tibia, 74–75, 75 (illustration)
electromyography, 28–29
tear of knee ligaments, 59–60, 63
R
Release bindings
adjustment of, 169–224, 204 (table), 268
children’s boot/binding systems, 182–183, 183 (illustration), 207 (table), 212–216
DIN 7881 table for, 207
age of and deviation release/settings, 171 (illustration), 174–175
and anterior cruciate ligament injury, 55–60, 65
for children/adolescent skiers, 167–177, 188–201, 212–224
for cross-country skis, 102, 105–108
electromechanical, 249–259
heel release, 79–85
microcomputer controlled, 235–259
models
and deviations in release/settings, 174–176
mounting of, 174–176
on-slope evaluation, 169–179, 235–248
partial releases, 219
selection of release torque values, ASTM F 27, 121
setting of,
ASTM F 504: 120, 203, 208
test devices for, 217–224
Repair, surgical
knee tendon grafts, 69–76
Rescue operations
use of helicopter, 323–325
Rotation, knee joint
comparison, laboratory vs field data, 23–24
longitudinal, 16–23
medial-lateral, 29
related to external moments of foot, 5–25
varus-valgus, 10–16
S
Safety measures, for skiers, 1, 329–332
Safety standards, see ASTM Standard; German Industrial Standards; International Association for Safety in Skiing; International Standards Organization; Swiss Association for Accident Prevention
Sex factors
binding adjustment systems, 182, 202–211
Shaft design, ski boots, 154–165
Ski boots, see Boots
Ski brakes, 267
Ski poles
and thumb injuries, 299–306
Ski release bindings, see Release bindings
Skier’s parameters
and selection of release binding settings, 202–211, 204, 207 (tables)
Skiing accidents, see Injuries, skiing
Skiing trauma, see Injuries, skiing
Skis
bending tests, 90–91, 93
cross-country, 102, 105 (tables)
breaking strength, 103–105
deflection, 90–96
mass of, 88, 91 (illustration)
mechanical properties, 86–109
moment of inertia, 88–90, 92
natural frequency, 95
rigidity, 91–92, 94
torsion, 91–92
vibration of, 95
Spinal cord injuries, 314–319
Sports mechanics, 5–52
Sprains
ankle joint, 114, 265–266
knee joint, 268, 276
Statistical scattering
release binding systems, 207
Surgery
knee, 68–76
early versus late repair, 72, 74
extraarticular augmentative technique, 71 (illustration), 73, 75–76
tarsal tunnel syndrome, 149–150
Swiss Association for Accident Prevention (BfU)
standards for release bindings, 180–188
test device for ski bindings, 214, 218
Tarsal tunnel syndrome
caused by boot compression, 149–150
Temperature
effects on boot pressure distribution, 157–159
effects on boot stiffness, 134–144, 157–159
relationship to ski accidents, 280–287
transition, 280–287
Test devices
for binding adjustment, 217–224, 222
(Table)
Testing
binding/boot systems, use of anthropometric dummy, 225–232
release bindings
in laboratory, 188–201, 212–216, 225–231, 242–247
ski boots
force deflection curve test, 120
measuring mat, 154–155
use of human vs prosthetic legs, 128–144
skis
SKI TEST, 86–99
cross-country, 103–109
Thermoplastic rubber
use in children’s ski boots, 190–201, 214
Thumb injuries, 299–306
Tibia
avulsion fracture, 69
displacement, 64
fractures of, 69, 114–116, 275–276, 277
(Table), 279
children/adolescents, 185
head measurement and binding release setting, 181, 185, 205–206
mechanical loading in falls, 84
strength of, 185
and heel release, 79–80
Time—domain pulse transfer, function model, 7
Torque measuring devices, 217–224
Torsional stiffness, knee joint, 26–52
Torso trauma, 288–296, 293 (illustration)
Treatment
anorectal abcess, 310–312
costs, ski injuries, 295
First aid, 323–325
surgery,
knee, 69–73
tarsal tunnel syndrome, 149–150
thumb injuries, 299–305
Triceps surae muscle, 83
U–W
Urogenital trauma, 291–295, 294 (illustration)
Varus-valgus rotation, 10–16
Warning sign in snow, 281
West Germany, skiing population, 289–291