Injury

B3 · SL and HL

Fewer recorded injuries: prevention benefit or less exposure?

Compare mechanisms and evidence

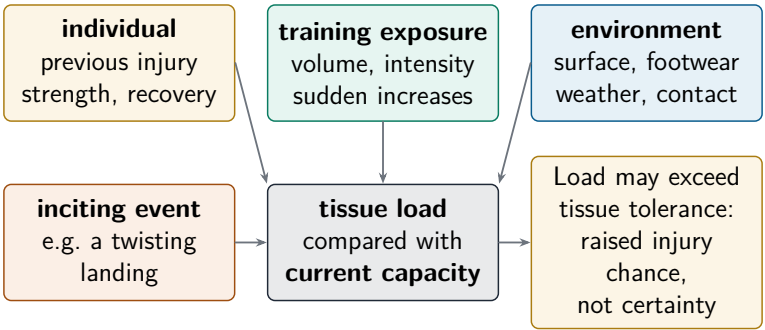
B3 covers interacting risk factors, acute/cumulative trauma, prevention, treatment principles and staged concussion recovery.

AHL: biomechanical maladaptations and fair tests of technique changes.

All datasets are invented. Class work analyses evidence; students do not provoke injuries, diagnose peers or give return-to-play clearance.

An outcome can have several interacting influences

Possible influences, not measured probabilities or proof of cause



A risk factor is not an inevitable cause or a diagnosis.

Distinguish the individual from the setting and task

Factor group	Examples and reasoning limit
Internal	Age/development, physiological differences, pregnancy, previous injury and training effects
External	Surface, equipment, rules, weather, contact and activity organization
Interaction	Current capacity and recovery affect tolerance of the external task; a category does not predict every individual

A visible surface is not automatically the sole cause

1. **Invented runner.** Returning after an ankle injury, with reduced control, an abrupt volume increase and uneven ground.
2. **Mechanism and risk.** A damaging twist describes a possible mechanism. Previous injury, capacity, exposure and surface are possible interacting risk factors.
3. **Evidence.** Compare alternative explanations and the event sequence; training can improve capacity or exceed it when poorly matched to recovery.

Classify loading history separately from affected tissue

Description	What it establishes
Acute trauma	A sudden event, excessive force or unexpected direction
Cumulative trauma	Repeated loading whose effects exceed recovery/adaptation
Symptom onset	Can be sudden after a cumulative history; timing alone does not reveal every preceding cause

Name the tissue before interpreting the injury label

Example	Affected structure and possible history
Sprain / strain	Ligament / muscle or tendon; acute and repeated-load contexts differ
Fracture / bone stress injury	Bone; sudden excessive force / repeated loading can be relevant
Abrasion / other tissue injury	Skin; friction or contact; cartilage/fascia also transmit and distribute loads

Brain function can be disturbed without loss of consciousness

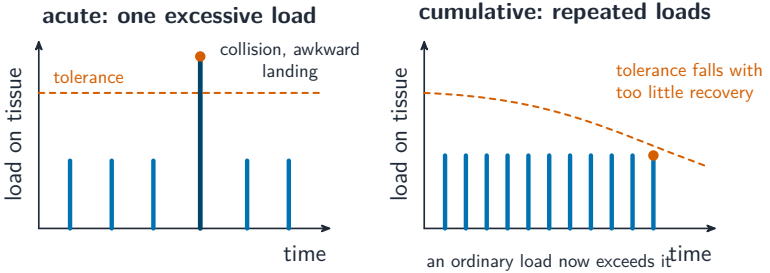
Concussion is not ruled out by one apparently normal observation

A body impact can transmit force to the head. A direct head blow and loss of consciousness are not required in every case.

Headache, dizziness, balance, thinking or behaviour changes can be relevant. Routine structural imaging can be normal despite functional disturbance.

Whole-body force does not identify stress in one tissue. Concerning findings require clinical assessment; this unit does not teach structural neuropathology.

Acute and cumulative injury



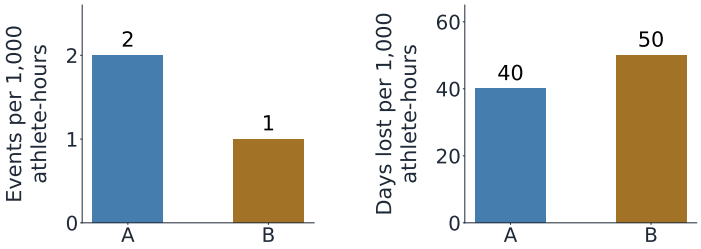
Recovery decides whether tolerance holds

An athlete-hour counts each participant's actual exposure

1. **Teaching exposure.** 12 participants $\times$ 8 sessions $\times$ 1.5 hours $=$ 144 athlete-hours if everyone completes all sessions.
2. **Practice.** $10 \times 6 \times 1.5 = 90$ athlete-hours. Eight events / 4,000 hours $\times$ 1,000 $=$ 2 per 1,000 athlete-hours.
3. **Definition.** Specify new event, complaint/time-loss definition, actual participation and training/match exposure. A rate per time is not a percentage of people.

A lower event rate can coexist with greater time-loss burden

Invented records:
event rate and time-loss burden differ



A: 6 events / 3,000 h; 120 days lost
B: 8 events / 8,000 h; 400 days lost

Counts, rates and days lost answer different questions.

Calculate both rates before ranking the groups

1. **Invented counts and rates.** A: $6/3{,}000 \times 1{,}000 = 2$. B: $8/8{,}000 \times 1{,}000 = 1$ event per 1,000 athlete-hours.
2. **Time-loss burden.** A: $120/3{,}000 \times 1{,}000 = 40$; B: $400/8{,}000 \times 1{,}000 = 50$ days lost per 1,000 hours.
3. **Meaning.** B has more events, lower event frequency per exposure and greater time-loss burden. Keep severity, recurrence and absence definitions consistent.

Small event counts limit the confidence of a comparison

1. **Practice.** 9/4,500 gives 2 per 1,000; 3/1,000 gives 3; 4/2,000 gives 2.
2. **Recording.** Under-reporting, missing exposure and changed injury definitions can alter the recorded estimate.
3. **Inference.** Different tasks and participants confound comparison. A group rate does not determine one person's future injury outcome.

Connect each intervention to the demand it addresses

Approach	**Possible mechanism and limit**
Training / warm-up	Progressive strength/control and preparation can support capacity; a routine does not prevent every injury
Flexibility / technique	Useful task-specific range and controlled movement; more range is not always better
Rules / equipment	Developmentally suitable demands and fitted protection reduce particular mismatches or consequences

A helmet is useful protection, not a concussion-proof guarantee

Match equipment to its user and the actual mechanism

Fit, maintenance, appropriate standards and intended sport matter. Padding can distribute an impact over time or area.

No helmet eliminates every transmitted brain force. Equipment supplements safe rules, coaching and injury recognition.

Footwear and surface interact: more traction may help one task but change unwanted joint loading in another.

Test the intervention and the recording system

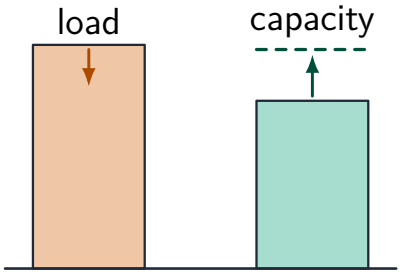
A rise in reporting can accompany improved care

Keep case definitions, exposure, participants, task and time-of-season comparisons appropriate.

Use suitable controls/allocation where feasible; report adherence, missing records and unwanted outcomes.

A large relative change based on a few events is uncertain. Fewer events do not establish success if exposure fell or reporting changed.

Load and capacity



raise capacity: progressive programme, prehabilitation, technique practice

manage load: rules and equipment for the participant, gradual progression

> Risk rises where load outgrows capacity

Inflammation supports repair while symptoms may need management

Pain relief, healing and sporting readiness are different outcomes

Blood-flow, vascular and immune changes help organize defence, removal of damaged material and repair.

Swelling and pain can accompany useful processes. Eliminating every sign is not automatically the best healing strategy.

Less pain does not establish restored load capacity. Clinical assessment and the task demands guide treatment and progression.

Treatment names do not substitute for assessment

Approach	**Reasoning boundary**
Compression / elevation / ice	Can manage particular symptoms; suitability and application matter; pain relief does not prove faster repair
NSAIDs	May manage inflammation/pain but have adverse effects and are not suitable for everyone; no classroom prescribing
Surgery / rehabilitation	Some severe tears/fractures need repair; progressive restoration of range, strength and control is individualized

Return to activity is a reviewed process

Evaluate the relevant function over time

Modalities should serve a defined goal supported by evidence; naming a device is not proof of benefit.

Restore appropriate range, strength, control and tolerance of task demands with qualified oversight.

A symptom improvement or an arbitrary number of days does not alone provide return-to-play clearance.

Separate recognition from diagnosis and clearance

1. **Initial response.** After suspected concussion, remove from activity and arrange appropriate assessment; no same-day sporting return.
2. **Urgent concerns.** Worsening headache, repeated vomiting, seizures, increasing drowsiness or new weakness after an impact need urgent emergency assessment.
3. **Boundary.** One good answer, no loss of consciousness or one normal routine scan cannot establish that all relevant function is normal.

Relative rest does not mean complete isolation until symptoms vanish

Clinical advice guides early demands and later progression

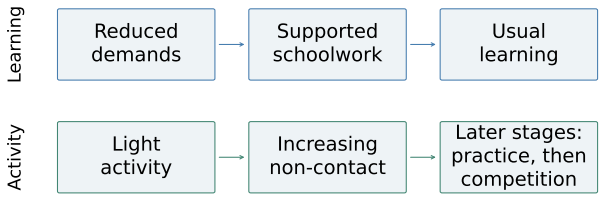
A short initial relative-rest period commonly covers the first 24–48 hours; suitable daily activity is different from unrestricted sport.

Learning may resume with support such as breaks, reduced demands or more time, according to individual needs and medical advice.

Clinical assessment distinguishes early symptom-limited activity from later contact/fall-risk stages. School attendance is not contact-sport clearance.

Learning support and physical progression can overlap

After clinical assessment:
example pathways, not a timetable



Review symptoms and tolerance.
Pause or step back when needed.
Contact-risk stages require medical authorization.

Review symptoms and tolerance; boxes are not automatic clearance.

A minimum stage duration is not a promised recovery deadline

1. **CDC framework.** Regular activities → light aerobic → moderate → heavy non-contact → appropriate practice/full contact → competition.
2. **Review.** Healthcare-provider approval/supervision guides progression; full return requires ordinary non-sport activities without injury-related support. Stages usually take at least 24 hours; symptoms may require pauses or a step back.
3. **Invented follow-up.** Ratings 3, 2, 3, 1, 0 include a temporary rise. The final zero does not establish tolerance of all learning, exertion or contact demands.

AHL: A maladaptation is a task–capacity mismatch, not any unusual style

Connect movement patterns to repeated demands and recovery

Body proportions, prior injury, equipment and constraints affect what adjustment is useful.

A throwing sequence can redistribute demands between segments; a stride change can redistribute loads rather than eliminate them.

Observed joint angles and smooth-looking video are not direct tissue-stress measurements or proof of lower injury risk.

AHL: Changed camera geometry confounds an angle comparison

1. **Invented observation.** A different apparent landing angle follows coaching, but the camera also moved.
2. **Stronger measurement.** Standardize task, phase, landmarks, scale, frame rate and geometry; repeat and assess observer agreement. Appropriate additional views/force measurements can help.
3. **Inference.** The recording supports an apparent projection change. It does not establish tissue stress, injury causation or medical clearance.

AHL: A before/after rate change is not alone a causal estimate

1. **Invented coaching record.** Before: $18/6{,}000 \times 1{,}000 = 3$; after: $12/6{,}000 \times 1{,}000 = 2$ per 1,000 athlete-hours.
2. **Two differences.** Absolute reduction 1 per 1,000; relative reduction $(3-2)/3 \approx 33.3\%$, not 33.3 percentage points of participants.
3. **Alternative explanations.** Season, training load, reporting and participant changes need an appropriate comparison and consistent recording.

AHL: A load-proxy change is not an injury-probability percentage

1. **Invented proxy.** 400 repetitions $\times$ index 100 $=$ 40,000; 300 $\times$ 80 $=$ 24,000 arbitrary units.
2. **Calculate.** Repetitions fall 25%; per-repetition index 20%; total 40%. Remaining fractions $0.75 \times 0.80 = 0.60$.
3. **Limit.** Proxy validity, nonlinear tissue responses, recovery and other loads matter. Do not infer a 40% injury-risk reduction or provoke painful repetitions to test it.

Attempt the handout questions before the worked answers

State definitions, denominators and interpretation limits

Classify risk factors, loading history and tissue; compare event rates and time-loss burden.

Evaluate prevention and treatment claims; explain concussion recognition and staged clinical recovery.

AHL: assess technique measurements, before/after comparisons and the limits of an invented load proxy.

Check the rate and burden arithmetic independently

1. **Exposure and rates.** 90 athlete-hours; 8/4,000 gives 2 per 1,000. Original A/B rates 2 and 1; practice rates 2, 3 and 2.
2. **Severity.** Original days-lost burdens 40 and 50 per 1,000 athlete-hours reverse the ranking by event rate.
3. **Interpretation.** Rates are not percentages of people. Small samples, under-reporting and different exposures/participants limit conclusions.

Check yourself

Match the claim to what the evidence can establish

Define the injury, exposure and outcome. Separate event counts, rates, participant percentages and days-lost burden.

Risk factors interact. Protection does not mean zero risk; symptom relief is not healing or clearance. Concussion recovery needs staged review.

AHL: camera geometry, inferred loading and outcome evidence are separate; a proxy reduction is not the same percentage reduction in injury probability.