Pain Management in the Elite Athlete: The 2017 IOC Consensus Statement
• 20 Experts – published and leaders in their respective field
• 12 month lead in period
• Extensive review of the available literature

• Sports Medicine
• Orthopedics
• Pain Medicine
• Anesthetics
• Neurology
• Physiotherapy
• Psychiatry
• Psychology
• Pharmacology/Pharmacist
• Ethics

• ISAP, IPC
Consensus statement

International Olympic Committee consensus statement on pain management in elite athletes

Brian Hainline,1 Wayne Derman,2 Alan Vernec,3 Richard Budgett,4 Masataka Deie,5 Jiří Dvořák,6 Chris Harle,7 Stanley A Herring,8 Mike McNamee,9 Willem Meeuwisse,10 G Lorimer Moseley,11 Bade Omololu,12 John Orchard,13 Andrew Pipe,14 Babette M Pluim,15 Johan Ræder,16 Christian Siebert,17 Mike Stewart,18 Mark Stuart,19 Judith A Turner,20 Mark Ware,21 David Zideman,22 Lars Engebretsen4

Review

Pain in elite athletes—neurophysiological, biomechanical and psychosocial considerations: a narrative review

Brian Hainline,1 Judith A Turner,2 J P Caneiro,3 Mike Stewart,4 G Lorimer Moseley5

Definition of pain

- ‘Unpleasant sensory and emotional experience associated with actual or potential tissue damage,’
  - International Association for the Study of Pain (ISAP) www.iasp-pain.org

- Physical and emotional experience
- Evolutionary perspective – ”Threatened tissue”
- Evidence in gen population about pain eg in lower back in general practice.
- Very little about pain in sports medicine
Pain in elite athletes – neurophysiological, biomechanical and psychosocial considerations
Traditional way of thinking in Sports Medicine

Pain = Injury
Give analgesics!
We need to shift our thinking about pain in sport!

Pain is not necessarily synonymous with an injury. Injury can occur without pain.

Pain can develop or persist independent of the recovery status of the injury.

Loose association between imaging findings and tissue abnormalities; thus complex aetiology. Therefore important to identify type of pain prior to planning management.
Types of pain

- **Nociceptive pain**: pain generated by a noxious insult that activates nociceptors in peripheral tissues. Nociceptive pain is associated with tissue damage or inflammation that activates nociceptors in peripheral tissues. *Inflammatory pain* is a type of nociceptive pain.

- **Neuropathic pain**: pain caused by a lesion—demonstrable by diagnostic investigations or by clear frank trauma—or disease (i.e., a known disorder such as stroke or diabetes mellitus) of the somatosensory nervous system.

- **Nociplastic/algopathic/nocipathic pain**: pain that arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence of disease or lesion of the somatosensory system causing the pain.

- **Pain of unknown origin**: pain that cannot be classified as nociceptive, neuropathic or nociplastic/algopathic/nocipathic.

- **Referred pain**
### Afferent signals for pain

#### The Pain Pathway

<table>
<thead>
<tr>
<th>Fibre Type</th>
<th>Characteristics</th>
<th>Speed of Conduction</th>
<th>Associated With:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aδ (delta)</td>
<td>Small, myelinated</td>
<td>12 - 30 m/sec</td>
<td>Cold, fast pain, mechanical stimuli</td>
</tr>
<tr>
<td>C</td>
<td>Small, unmyelinated</td>
<td>0.5 - 2 m/sec</td>
<td>Slow pain, temperature, mechanical stimuli</td>
</tr>
</tbody>
</table>
Somatic sensations

- Receptor inputs → somatosensory cortex
- Body parts with the largest areas = greatest sensory acuity, require intricate control
- Fingers, thumb and lips
Subacute (6-12 wk) nociceptive pain may be associated with various tissue based issues

This low level inflammation in addition to other factors:
Sleep deprivation
Ongoing stress further reduce the nociceptive threshold
Normal mechanical demands painful

Insufficient surrounding
Counterforces:
• Improper training
• Improper recover
•Both
• Leads to tendon reactivity

Ongoing repetitive tissue load
Stress cycles beyond capacity

Ongoing cycle of
Inflammation-repair-remodeling-
inflammation of local tissues and thus introduce new local sources of nociceptive activation

Cycle continues if factors are not addressed
Neuropathic Pain

- Lesion related (trauma or disease)—demonstrable by diagnostic investigation in the somatosensory nervous system
- Clinical description not a diagnosis
- No diagnostic tool (grading system) based on neurological tests
Neuropathic vs nociceptive pain:

**Nociceptive Pain**
- Inciting event
- Associated with tissue damage or inflammation
- Nociceptors activated

**Neuropathic Pain**
- Primary lesion in or dysfunction in the nervous system
- Not dependent on nociceptor activation
- Trauma to nerve root, peripheral nerve or spinal cord
Nociplastic / Algopathic / Nocipathic pain
(ICD-11- Primary Pain)

- Cannot identify specific aetiology but clinical and psychophysical findings suggest altered nociceptive function
- But nerve or tissue injury cannot be identified
- Hypersensitivity (exaggerated)
- “Dysfunctional pain”
- Examples: fibromyalgia, CRPS, IBS, nonspecific LBP
- Mechanism: ? Central sensitisation (increased responsiveness to nociceptive normal or subthreshold input)

- NO THREAT OF DAMAGE TO TISSUE OR LESION OF THE SOMATOSENSORY NERVOUS SYSTEM
- Accompanied by depression and anxiety, sleep disturbance, poor physical conditioning
Referred pain

- Due to multiple primary sensory neurons that converge onto a single ascending tract
- Brain is unable to distinguish visceral signals from more common signals arising from somatic receptors
- Pain is interpreted as coming from the somatic regions rather than the viscera
- Example: cardiac ischemia felt in the neck and down the left shoulder and arm

Athletes can present with one or any combination of these types of pain
Neural pathways & pain modulation

Painful stimuli → Ascending pathways → Cortex → Conscious sensation → Limbic system, hypothalamus, sensory areas

PAIN & ANXIETY

I'm fine.
Feeling
I'm Nothing to Everyone

NEGATIVE ATTITUDE

POSITIVE ATTITUDE

Pharmacology 
Medicine

Nutrition 
the right balance of real foods

Enthusiasm
Cooperation
Integrity
Tolerance
Empathy
Confidence

Creativity
Independence
Curiosity
Tolerance
Compassion
Confidence

Nutrition
Exercise
Nutrition
Exercise
Pain perception

- Magnified by past experiences
- Suppressed in emergencies (and in sport)
  - Descending pathways → through the thalamus → inhibit nociceptor neurons in the spinal cord
  - Before the stimuli are sent via the ascending spinal tracts
Pain is romanticised and considered a “normal” part of sport.
Pain in elite athletes – neurophysiological, biomechanical and psychosocial considerations:

- Pain modulation:
  - Athletes have a higher pain tolerance compared to active controls
  - Less evidence for any differences in pain threshold

- Psychological factors:
  - Athlete attitudes toward pain are different from non-athletes
  - Develop effective skills in coping with pain – might be able to manage minor discomfort during competition
Pain in elite athletes – neurophysiological, biomechanical and psychosocial considerations
<table>
<thead>
<tr>
<th>Onset</th>
<th>Assessment</th>
<th>Nociceptive</th>
<th>Inflammatory</th>
<th>Neuropathic</th>
<th>Nociceptive/algopathic/nociceptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>History/physical exam</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td></td>
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<tr>
<td>Insidious</td>
<td>○</td>
<td>●</td>
<td>○</td>
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<tr>
<td>Associated with swelling</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Associated with autonomic disturbance</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Associated with spike in load</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Associated with psychosocial stress</td>
<td>○</td>
<td>●</td>
<td>○</td>
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<table>
<thead>
<tr>
<th>Location</th>
<th>History/physical exam</th>
<th>○</th>
<th>●</th>
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<tbody>
<tr>
<td>Confined to anatomical structure</td>
<td>●</td>
<td></td>
<td>○</td>
<td></td>
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<tr>
<td>Spread along anatomical lines</td>
<td>●</td>
<td></td>
<td>○</td>
<td></td>
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<tr>
<td>Spread along biomechanical movement</td>
<td>●</td>
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<tr>
<td>Spread along dermatome</td>
<td></td>
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<td>●</td>
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<tr>
<td>Spread within limb/immediate area</td>
<td>○</td>
<td></td>
<td></td>
<td>○</td>
<td></td>
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<tr>
<td>Spread to whole limb/extended area</td>
<td>○</td>
<td></td>
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<tr>
<td>Spread to hemibody</td>
<td>●</td>
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<td>○</td>
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<tr>
<td>Spread to full body</td>
<td>●</td>
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<table>
<thead>
<tr>
<th>Aggravators</th>
<th>History</th>
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<tbody>
<tr>
<td>Mechanical load</td>
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<tr>
<td>Inactivity</td>
<td>●</td>
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<tr>
<td>Heat</td>
<td>●</td>
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<tr>
<td>Cold</td>
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<table>
<thead>
<tr>
<th>Biomechanical assessment</th>
<th>Physical exam</th>
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<tbody>
<tr>
<td>Inefficient load transfer</td>
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<table>
<thead>
<tr>
<th>Sensory exam</th>
<th>History/physical exam</th>
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<tr>
<td>Numbness</td>
<td></td>
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<td>●</td>
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<tr>
<td>Local mechanical sensitivity</td>
<td>●</td>
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<td></td>
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<tr>
<td>Local heat sensitivity</td>
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<tr>
<td>Widespread mechanical sensitivity</td>
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<td>●</td>
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<tr>
<td>Local cold sensitivity</td>
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<td></td>
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<td></td>
<td>●</td>
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<tr>
<td>Demonstrable sensory/motor loss</td>
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<td>●</td>
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<table>
<thead>
<tr>
<th>Psychological factors</th>
<th>Interview and questionnaires</th>
<th>●</th>
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<tbody>
<tr>
<td>Depression and/or anxiety</td>
<td></td>
<td>●</td>
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<tr>
<td>Catastrophising</td>
<td></td>
<td>●</td>
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<tr>
<td>Fear-avoidance (fear of pain and avoidance of activity due to excessive fear of pain and/or inaccurate beliefs that activity will cause physical harm)</td>
<td>●</td>
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</table>

<table>
<thead>
<tr>
<th>Lifestyle factors</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Poor sleep volume or quality</td>
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<tr>
<td>Poor nutrition</td>
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<td></td>
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<tr>
<td>Poor sense of well-being</td>
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<td></td>
</tr>
</tbody>
</table>

Filled circles indicate most likely, shaded circles less likely and no circles least likely.

*Denotes possibility of disease process and should be considered in light of general medical screening for red flags.
“Despite the perception that the use of medications and non-pharmacological strategies to relieve and prevent pain is widespread in sport, we could identify NO COMPREHENSIVE ASSESSMENT OF THE FREQUENCY AND EFFECTS OF SUCH USE AMONG ELITE ATHLETES.”
The ETHICS of Treating Pain in Athletes

“The treating physician must balance the RISK of the analgesic actually causing the athlete to either DELAY the time to complete healing or cause an EXACERBATION of the original injury because of an inhibition of the pain response.”
Non-Pharmacologic Interventions FIRST

• Modalities
• Massage
• Movement, Strength and Conditioning
• Sleep
• Nutrition
• Cognitive Behavioral Therapies
Principles of Pain Management in Athletes

• Medication prescription should be only one component of managing pain. Combining medication use with appropriate non-pharmacological measures limits disability and optimizes probability of improvement.

• Medications should be prescribed at the lowest effective dose for the shortest period of time. They should be discontinued if they are ineffective or not tolerated, and as the pain from the injury resolves.
Principles of Pain Management in Athletes

• Medications should be prescribed in a manner consistent with established, recognized pharmacological and pharmacodynamic principles, including route of administration, time of onset of action, effectiveness for pain relief and potential side effects and complications. Consideration of an athlete’s medical and medication history is essential.

• Physicians prescribing analgesic medications to athletes should possess a complete understanding of the prevailing rules and regulations regarding prohibited substances and Therapeutic Use Exemptions specific to the governing body that controls the athlete’s sport.
Principles of Pain Management in Athletes

• Recording athlete-reported severity of pain (eg, with a numerical rating scale) can be useful in monitoring the effectiveness of a medication.

• Prescription medications should only be provided to athletes by licensed healthcare providers who understand potential side effects or misuse of medications, and whose licensure includes this scope of practice. Written documentation of each assessment and prescription is a basic standard of care.
Principles of Pain Management in Athletes

- **Informed consent** is fundamental in medical care, including those situations in which medication is prescribed. This is also true for care of the elite athlete; however, obtaining such consent can be challenging in competitive situations when an athlete seeks same-day RTP. **At a minimum, any substantial risk of short-term or long-term worsening of an injury should be discussed and documented.**

- **Medications should not be prescribed to athletes for pain or injury prevention.**
<table>
<thead>
<tr>
<th>Type</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intravenous</td>
<td>- Morphine (10 mg)</td>
</tr>
<tr>
<td></td>
<td>- Fentanyl (100 mcg, titrated to effect)</td>
</tr>
<tr>
<td>Inhalation</td>
<td>- Entonox/Nitronox (inhaled 50:50 oxygen and nitrous oxide mixture)</td>
</tr>
<tr>
<td></td>
<td>- Methoxyflurane/penthrrox</td>
</tr>
<tr>
<td>Intranasal</td>
<td>- Diamorphine (1600 mcg in commercially available administrator)</td>
</tr>
<tr>
<td></td>
<td>- Fentanyl (100 mcg administered via nasal syringe adapter)</td>
</tr>
<tr>
<td>Mild to moderate pain</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Paracetamol (oral)</strong></td>
<td>Loading dose up to 2 g, then 325–1000 mg PO every 4–6 hours, up to 4 g per 24 hours</td>
</tr>
</tbody>
</table>
| **NSAIDs (oral)**     | ▶ Ibuprofen: 400–800 mg every 4–6 hours with food, up to 3200 mg per 24 hours  
▶ Naproxen: 250–500 mg 2× daily with food  
▶ Ketorolac: 10 mg every 4–6 hours with food, up to 40 mg per 24 hours  
▶ Celecoxib: 200–400 mg 2× daily  
▶ Etoricoxib: 90–120 mg once daily |
| **Topical analgesics**| ▶ Rubefacients: methyl salicylate; turpentine oil; ammonia water  
▶ Cooling sensation: camphor; menthol  
▶ Vasodilation: histamine dihydrochloride; methyl nicotinate  
▶ Irritation without rebefaction: capsaicin; capsicum oleoresin |
## Moderate to severe pain

<table>
<thead>
<tr>
<th>NSAIDs (injection)</th>
<th>Ketorolac: 15–30 mg IM or IV up to 4×/day, at least 6 hours apart, or a single 60 mg injection</th>
</tr>
</thead>
</table>

Local anaesthetic injections

**IV, intravenous; NSAIDs, non-steroidal anti-inflammatory drugs; IM, intramuscular; PO, oral.**
Box 1  Medication management for acute pain (pain duration less than 4–6 weeks) beyond the day of injury

Mild to moderate pain
  Oral paracetamol, non-steroidal anti-inflammatory drugs, topical analgesics, as per table 2.
  Corticosteroid injections (equivocal evidence):
  ▶ Intra-articular
  ▶ Bursal
  ▶ Peritendinous
  ▶ Epidural
  ▶ Facet
  ▶ Sacroiliac

Severe pain commensurate with injury
  Consider adding opioids:
  ▶ Initial prescription not to exceed 5 days
  ▶ No opioid prescription beyond 10 days
Box 2  Checklist to assess need for further evaluation

(Positive response indicates risk of deviation from the predicted path to recovery)

➢ Is the pain worsening, spreading or both?
➢ Is pain occurring at rest or during the night?
➢ Has any new pain emerged in other anatomical locations?
➢ Does the pain fluctuate in a manner not explained by mechanical load?
➢ Does the pain seem out of proportion to the severity of the injury?
➢ Is the quality of the pain changing or is the pain becoming more distressing?
➢ Has the athlete’s expectations of recovery changed for the worse?
What about Chronic Pain?

Table 3  Acute, subacute and chronic pain: definitions and treatment implications

<table>
<thead>
<tr>
<th>Pain duration</th>
<th>Type of pain</th>
<th>Treatment considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 weeks</td>
<td>Acute</td>
<td>Treatment focused on treating injury and managing pain, including identifying possible psychosocial and environmental factors influencing pain.</td>
</tr>
<tr>
<td>6–12 weeks</td>
<td>Subacute</td>
<td>Approach shifts from management of acute pain to improving function and preventing chronic pain and associated disability.</td>
</tr>
<tr>
<td>&gt;12 weeks</td>
<td>Chronic</td>
<td>Identify and continue to address psychosocial/environmental factors influencing pain, disability and dysfunction. Focus should be on improving function.</td>
</tr>
</tbody>
</table>

Table 4  Selected adjuvant medications for neuropathic and nociplastic/algopathic/nocipathic pain in adults*

<table>
<thead>
<tr>
<th>First-line medications</th>
<th>Total daily dose and dose regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticonvulsants</td>
<td></td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Begin at 100–300 mg 1–3×/day; may be increased to 1200–3600 mg/day in three divided doses</td>
</tr>
<tr>
<td>Pregabalin</td>
<td>Begin at 25 to 75 mg 1–2×/day; may be increased up to a dose of 150–600 mg/day in divided doses</td>
</tr>
<tr>
<td>Antidepressants</td>
<td></td>
</tr>
<tr>
<td>Serotonin–noradrenaline reuptake inhibitors: duloxetine</td>
<td>Begin at 20 to 30 mg 1×/day; may be increased up to 120 mg 1×/day</td>
</tr>
<tr>
<td>Serotonin–noradrenaline reuptake inhibitors: venlafaxine ER</td>
<td>Begin at 37.5–75 mg 1×/day; may be increased to 225 mg 1×/day or in divided doses</td>
</tr>
<tr>
<td>Tricyclic: amitriptyline or nortriptyline</td>
<td>Begin at 10–20 mg at night; may be increased to 150 mg at night</td>
</tr>
<tr>
<td>Second-line medications</td>
<td></td>
</tr>
<tr>
<td>Capsaicin 8% patches</td>
<td>1–4 patches to painful area for 30–60 min q 3 months</td>
</tr>
<tr>
<td>Lidocaine patches</td>
<td>1–3 patches to painful region 1×/day for up to 12 hours and then off for 12 hours</td>
</tr>
<tr>
<td>Tramadol</td>
<td>50–400 mg 2–3×/g</td>
</tr>
</tbody>
</table>

*There are many elite athletes who are teenagers and young adults, and an expert in managing this population should be consulted before beginning anticonvulsants or antidepressants for pain management.
Long-Term Safety of Using Local Anesthetic Injections in Professional Rugby League for Modified Indications

Salessa Sabak, MEng,* John W. Orchard, MD, PhD, FACSEP,† Leigh D. Golding, MBChB,‡ Elizabeth Steet, FACP,§ Steph A. Brennan, MSc,¶ and Amer Ibrahim, MBBS, FACSEP, FFSEM(UK)||

Injectable Nonsteroidal Anti-Inflammatory Drugs in Sport

Matthew J. Matava, MD

Injectable Corticosteroids in Sport

Nathan P. Olafsen, MD,* Stanley A. Herring, MD,† and John W. Orchard, MD, PhD, FACSM, FACSEP, FFSEM(UK)‡

“Deromanticising” the Image of Pain in Athletes

Wayne Derman, MBChB, BSc (Med)(Hons), PhD

Pain Management in Athletes With Impairment: A Narrative Review of Management Strategies

Lara Grobler, PhD,*† Wayne Derman, MBChB, PhD,* Cheri A. Blauwet, MD,‡ Sean Chetty, MBChB, PhD,§ Nick Webborn, MBBS,¶ and Babette Plummer, PhD||
Cannabis and the Health and Performance of the Elite Athlete
Mark A. Ware, MBBS, MSc,* Dennis Jensen, PhD,† † † § Amy Barrette, MSc,¶ Alan Vernec, MD, Dip Sport Med,¶ and Wayne Derman, MBChB, PhD** † †

Nonpharmacological Management of Persistent Pain in Elite Athletes: Rationale and Recommendations
G. Lorimer Moseley, DSc, PhD,* John Baranoff, PhD; † Ebonie Rio, PhD; † Mike Stewart, MSc,§ Wayne Derman, MBChB, PhD,¶ † † and Brian Hainline, MD**

Management of Pain in Elite Athletes: Identified Gaps in Knowledge and Future Research Directions
David A. Zideman, LVO, BSc, MBBS, FRCA, FRCP, FICM,* Wayne Derman, MBChB, PhD, † † Brian Hainline, MD,§ G. Lorimer Moseley, DSc, PhD, BPhy(hons), FAAHMS, FACP,¶ John Orchard, MD, PhD, FACSEP, FACSM,** Babette M. Pluim, MD, PhD, MPH, † † Christian H. Siebert, MD,¶ and Judith A. Turner, PhD † †

Novel Factors Associated With Analgesic and Anti-inflammatory Medication Use in Distance Runners: Pre-race Screening Among 76 654 Race Entrants—SAFER Study VI
Adrian Rotunno, MBBCh, MSc,* Martin P. Schwellnus, MBBCh, MSc, MD,* † † Sonja Swaneveldt, MSc,§ Esme Jordaan, MSc,¶ † † Dina C. Janse Van Rensburg, MBBCh, MMED, MD,* and Wayne Derman, MBBCh, PhD † †

Analgesic Management of Pain in Elite Athletes: A Systematic Review
Christopher A. Harle, PhD,* Elizabeth C. Danielson, MA,* Wayne Derman, MBChB, PhD,† Mark Stuart, BPharm, FFRPS, FRPharmS,† † Jiri Dvorak, MD,§ Lisa Smith, MS,* and Brian Hainline, MD¶
Thank you for your attention!