PERFORMANCE & RECOVERY

End of the Ice Age?

Heat vs. Cold for Athletic Optimization

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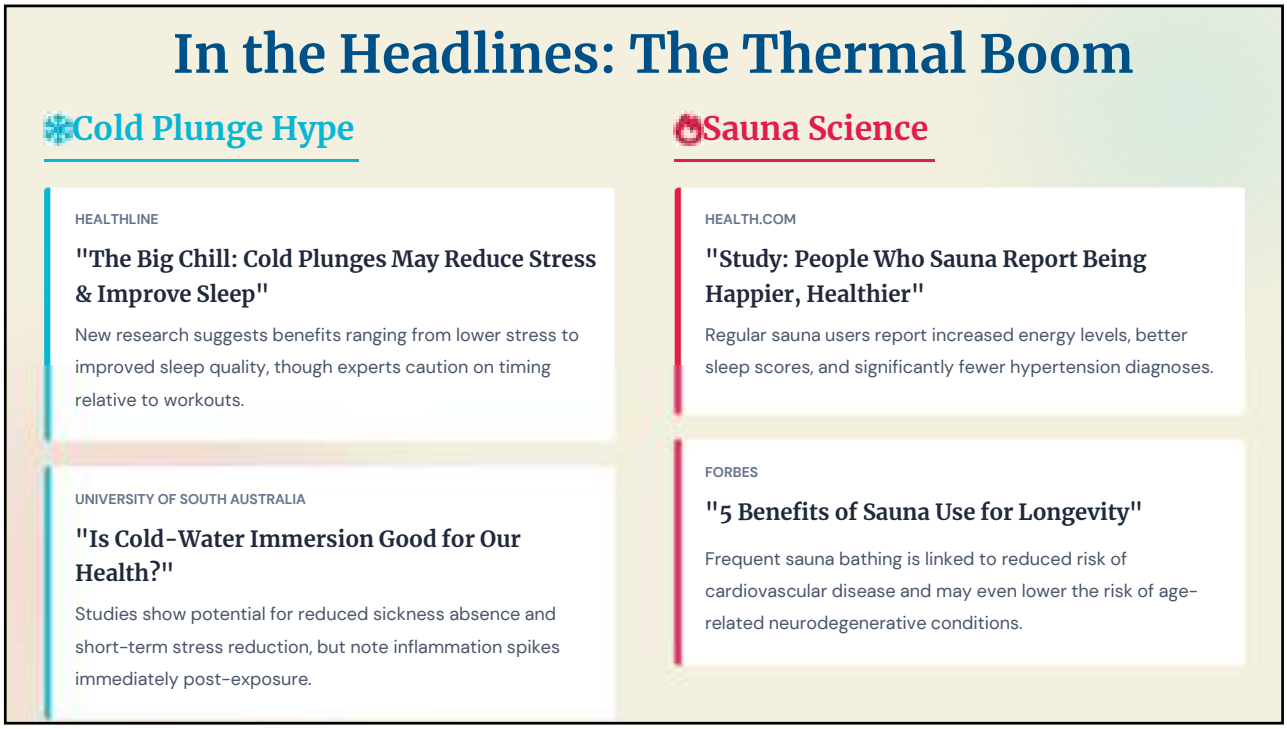
In the Headlines: The Thermal Boom
Cold Plunge Hype
HEALTHLINE
"The Big Chill: Cold Plunges May Reduce Stress & Improve Sleep"
New research suggests benefits ranging from lower stress to improved sleep quality, though experts caution on timing relative to workouts.
UNIVERSITY OF SOUTH AUSTRALIA
"Is Cold-Water Immersion Good for Our Health?"
Studies show potential for reduced sickness absence and short-term stress reduction, but note inflammation spikes immediately post-exposure.
Sauna Science
HEALTH.COM
"Study: People Who Sauna Report Being Happier, Healthier"
Regular sauna users report increased energy levels, better sleep scores, and significantly fewer hypertension diagnoses.
FORBES
"5 Benefits of Sauna Use for Longevity"
Frequent sauna bathing is linked to reduced risk of cardiovascular disease and may even lower the risk of age-related neurodegenerative conditions.

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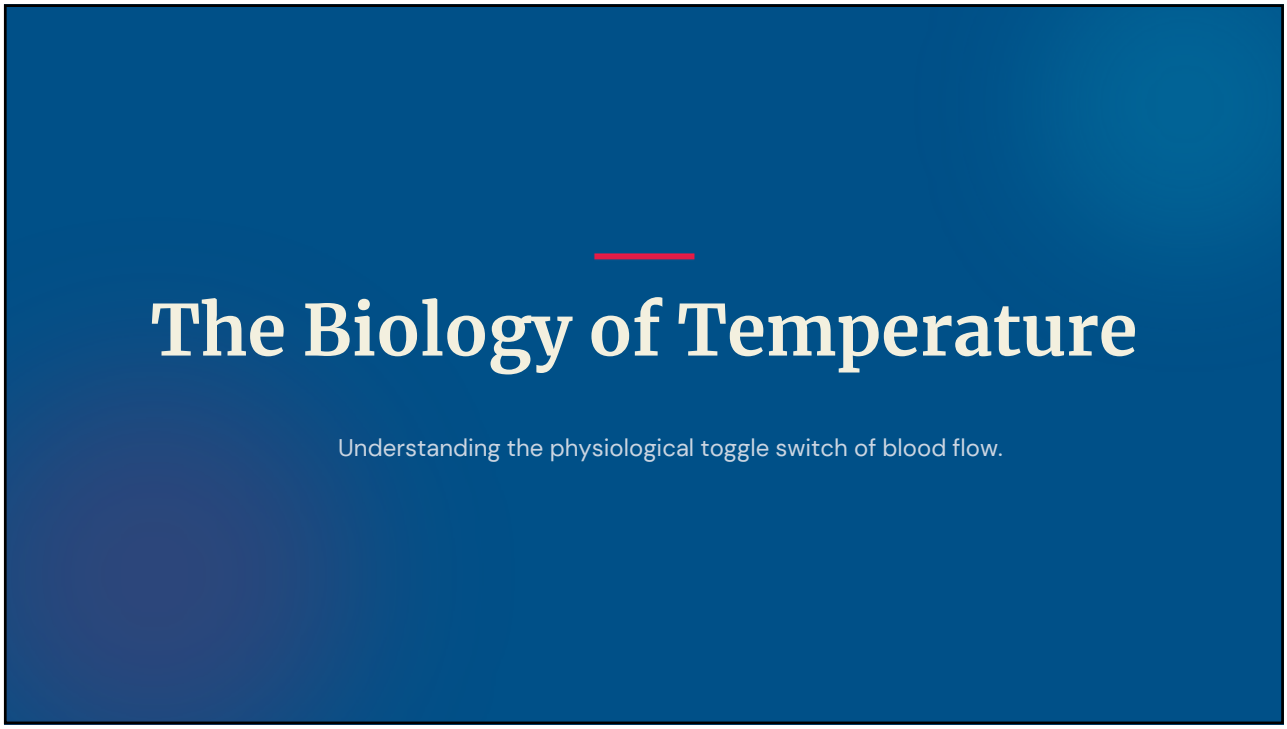
The Biology of Temperature
Understanding the physiological toggle switch of blood flow.

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The Vascular Mechanism

The body responds to temperature primarily through vascular manipulation:

Heat (Vasodilation)

Expands vessels, improving endothelial function and reducing arterial stiffness.
with time reduces inflammatory markers (TNF-α) and promotes anti-inflammatory pathways (IL-10).

Cold (Vasoconstriction)

Triggers SNS. Upregulates PGC-1α (mitochondrial biogenesis) and antioxidant defense. Acute inflammatory spike is followed by deep stress reduction and immune boost with upregulation of PSNS

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Historical Perspectives on Cold

The use of cold for injury management has a rich history, evolving from ancient wisdom to modern protocols.

- **Ancient Wisdom (c. 400 BC):** Hippocrates first documented the use of snow and ice to reduce pain and swelling, laying the foundation for cryotherapy.
- **Napoleonic Surgery (1812):** Baron Larrey observed painless amputations in freezing temperatures, recognizing cold as a powerful anesthetic.
- **The R.I.C.E. Era (1978):** Dr. Gabe Mirkin coined the R.I.C.E. protocol. However, modern research has questioned this

Wim Hof

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Historical Perspectives on Cold

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Local Cold: The Acute Responder

Cryotherapy Mechanics

Ice and topical heat generally applied for skin below 15 C (59F)

- **Analgesia:** Numbs nerve endings, providing immediate, drug-free pain relief.
- **Edema Control:** Vasoconstriction limits fluid leakage into surrounding tissues.
- **Metabolic Slowdown:** Reduces the metabolic demand of injured cells, potentially limiting secondary hypoxic injury. (very complex and controversial)

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The Cold Truth: Optimization Risks

Blunted Hypertrophy

CRITICAL: Cold suppresses the acute inflammation necessary for muscle growth. Using ice baths immediately after strength training can reduce muscle size and strength gains.*

Stiffness & Reduced Power**

Cold increases tissue viscosity. Never use static cold immediately prior to explosive movement, as it increases the risk of tears and reduces power output.

Nerve Damage

Applying ice directly to skin or for longer than 20 minutes can cause frostbite peripheral nerve injury (e.g. peroneal nerve at knee)

*effect not seen with PCM

*effect not seen for aerobic activity

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SUMMARY

PAIN
(both)

EXCESSIVE SWELLING
(local) ?both)

DOMS DECREASE
(systemic)

Recovery: 10-15 min CWI immediately (w/in 6 hrs) post-exercise (5-15°C) with 7-36 hr return to sport (explosive activity reduced for 1-6 hrs post CWI)

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Systemic Cold: Immersion

Cold Water Immersion (CWI) involves submerging the body in 50-60°F water. It affects the Central Nervous System (CNS) more than local ice.

- **CNS Reboot:** The shock of cold increases norepinephrine and dopamine, improving mood and perceived fatigue.
- **Parasympathetic tone with time:** potentially improving heart rate variability (HRV).

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For the Wim!

Cold therapy:
a tool for mental
and physical health

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- **Cold Water:** 8-15°C (46-59F) for 3-20 min improves mental health with possible immune system boost

  (but you do this separate from the training sessions)

  tap water usually 50-60F)

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we're in the COOL age

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OR MAYBE WE'RE JUST HEATING UP

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Historical Perspectives on Heat

A Universal Tradition

From the ancient history to modern spas, heat has been central to human wellness rituals.

- **Roman:** Massive public bathhouses that were centers of social and political life
- **Finnish Sauna:** A 2000-year-old tradition Estimates up to 90% of Finns will sauna once weekly
- **Global Variants:** Japanese Onsen (volcanic springs), Russian Banya, and Native American Sweat Lodges all utilize heat for spiritual and physical purification.

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BORN IN A SAUNA?

← Former prime minister Urho Kekkonen WAS

Robin Lod and Teemu Puki PROBABLY weren't

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Local Heat: Targeted Relief

Application & Benefits

Localized thermotherapy using heating pads, wraps, or hydrocollator packs is best suited for **sub-acute** and **chronic** conditions.

- **Tissue Extensibility:** Increases collagen elasticity, making it ideal pre-stretch or pre-workout.
- **Pain Gating:** Stimulates sensory receptors to block pain signals (Gate Control Theory).
- **Stiffness Reduction:** Essential for managing arthritis or old muscular injuries.

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Local Heat: Targeted Relief

DOMS

hot pack locally more effective than local cold for DOMS

((low level continuous heat for 8 hours after heavy exercise)

Dom Pérignon (most famous Dom)

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Sauna →

← Steam Bath

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Systemic Heat: The "Active" Recovery

Whole-body hyperthermia, such as sauna use (170°F+), triggers unique physiological adaptations that passive rest cannot duplicate.

- **Heat Shock Proteins (HSPs):** Repair damaged proteins and boost immune function.
- **Growth Hormone (GH):** Significant spikes in GH release which aids tissue repair.
- **Cardiovascular Mimicry:** Elevated heart rate provides a "workout" for the heart without musculoskeletal load.

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Protocols: Performance & Longevity

Athletic Performance

- **Goal:** Endurance & Plasma Volume.
- **Protocol:** 30 min post-exercise, 3x/week for 3+ weeks.
- **Temp:** 89°C - 108°C (192°F - 226°F).

General Health & Longevity

- **Goal:** Heart/ CV Health.
- **Protocol:** 4+ x/week, for 15-20 min
- **Temp:** 80°C (176°F)

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The Debate: Sauna vs. Hot Tub

Choosing the Right Tool

While both provide warmth, the physiological mechanisms differ significantly due to humidity and temperature.

Feature	Sauna (Dry Heat)	Hot Tub (Wet Heat)
Temp	160°F - 200°F	100°F - 104°F
Primary Benefit	**Cardiovascular:** High heart rate, heavy sweat, detox.	**Musculoskeletal:** Buoyancy unloads joints, relaxes tension.
Best Use	Metabolic health & endurance conditioning.	Acute soreness relief & joint pain (Arthritis).

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Recovery Comparison

- Muscle soreness reduction: Massage > CWT > CWI > active recovery
- CK reduction: CWT > HWI > CWI
- Neuromuscular recovery: Cryotherapy > CWT > CWI
- Perceived recovery: HWI > CWT > CWI

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Risks & Contraindications of Heat

Acute Inflammation

Cautious with an acute injury: Vasodilation will increase bleeding, swelling, and pain in the acute phase.

Burns & Tissue Damage

Prolonged contact, especially while sleeping with electric heating pads, can cause thermal burns.

Dehydration

Sauna use causes massive fluid and electrolyte loss. Without rehydration, this negates recovery benefits and impairs performance.

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The Optimization Paradox

Goal / Scenario	Recommended Therapy	Why?
Acute Injury (Sprain/Strain)	Cold (Ice)	Manage immediate swelling and pain.
Chronic Pain (Arthritis/Old Injury)	Heat	Reduce stiffness, increase flow, improve ROM.
Hypertrophy Training (Building Muscle)	Heat (or Passive)	**AVOID COLD Immediately.** Allow inflammation for adaptation.
Tournament / Competition (Multi-day)	Cold (CWI)	Prioritize **recovery speed** over adaptation. Flush fatigue.

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Clinical Decision Making

Clinical Goal / Condition	Preferred Modality	Rationale & Evidence
CVD & Hypertension	Sauna	Reduces arterial stiffness & BP. Improves endothelial function. Caution: Unstable angina.
Rheumatic Diseases (RA, Ankylosing Spondylitis)	Sauna	Significant reduction in pain scores & stiffness. Reduces systemic inflammation (Chronic).
Mental Health & Stress	Cold Water (CWI)	Catecholamine release improves mood. Significant stress reduction at 12hrs post-exposure.
Immune Function	Cold Water (CWI)	Up to 29% reduction in sickness absence. Acute stress response triggers immune adaptation.

*__Contraindications:__ Unstable angina, recent MI (Sauna); Cold intolerance, Raynaud's (CWI).

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Contrast Therapy

Best of Both Worlds?

Contrast therapy involves alternating between hot and cold immersion. This creates a manual "pumping" action in the vascular system.

- **Mechanism:** Rapid alternation between vasodilation and vasoconstriction acts as a vascular workout.
- **Effect:** Flushes metabolic waste (lactate) faster than passive rest without the stiffness of pure cold.
- **Protocol:** Typically 1 min cold : 3 min hot, repeated 3–4 times. End on cold for inflammation, hot for relaxation.

- some use hot tub

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Questions?

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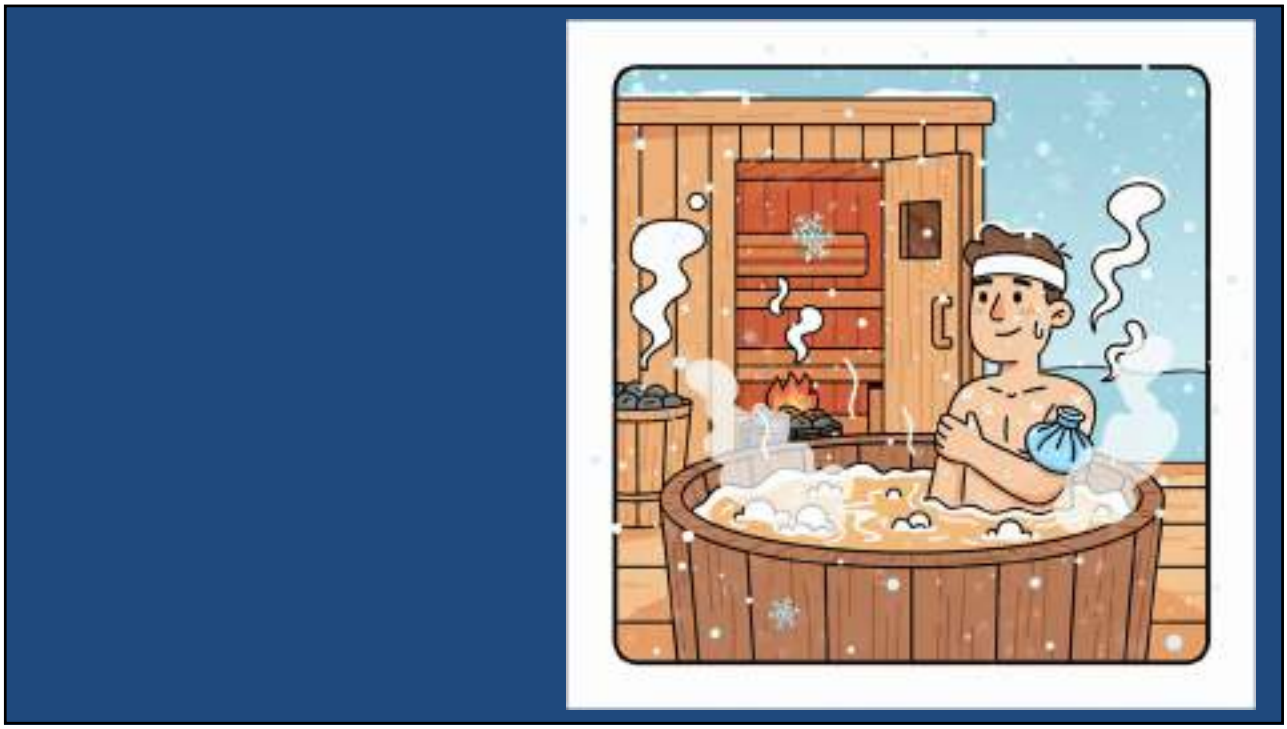

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