



# Thermoregulation in Sports

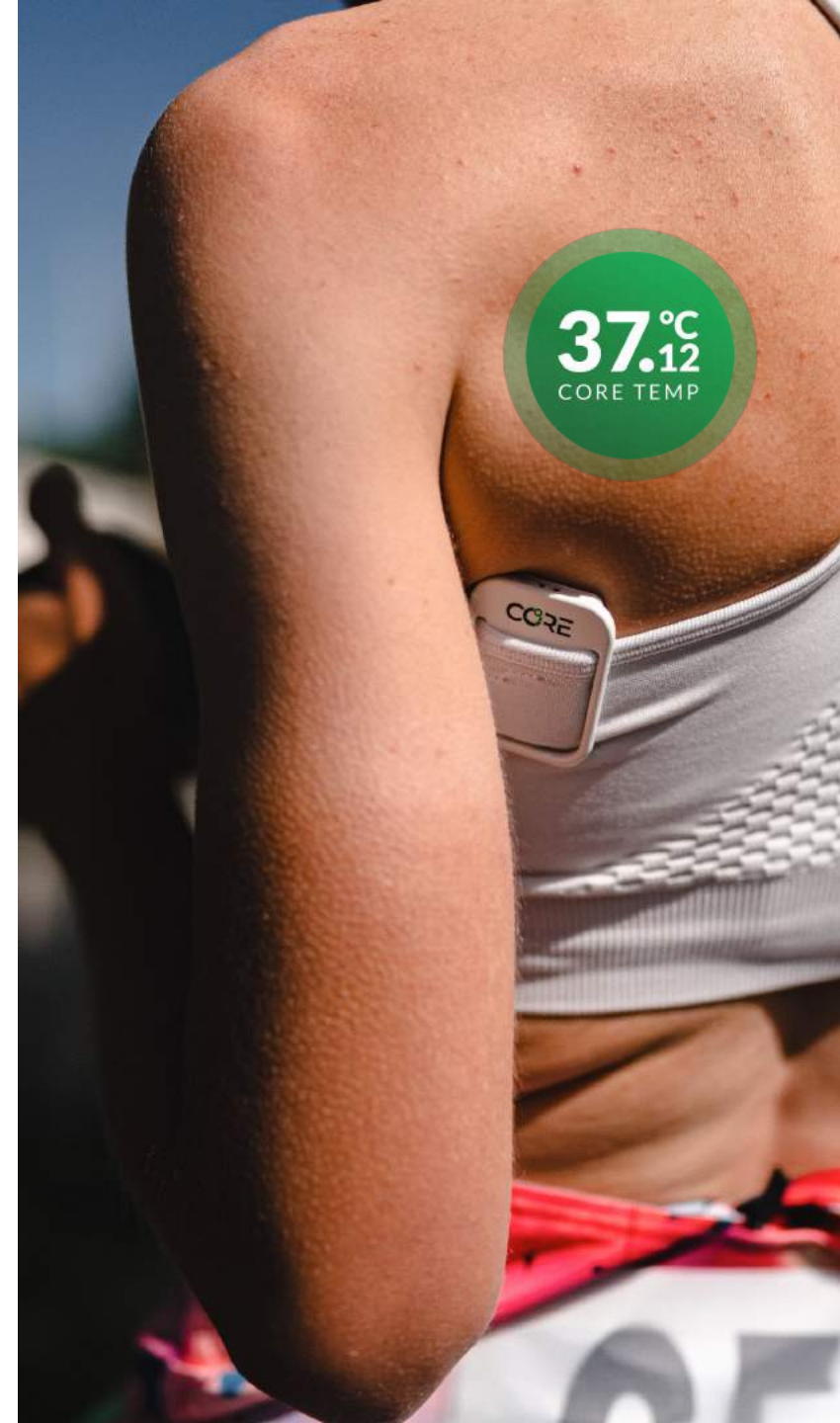
UPDATED OCTOBER 2023

# Why Is Thermoregulation Important?

**Optimizing your thermoregulation improves your sports performance.**

Just like every other part of your training, you can improve your thermoregulation by monitoring your core body temperature.

THERMOREGULATION IN SPORTS



# As We Heat Up, Performance Declines

But there are solutions...

## 01

### Heat Training

**Benefit:** You'll increase your hemoglobin and increase your power – even in cool conditions.

## 02

### Heat Adaption

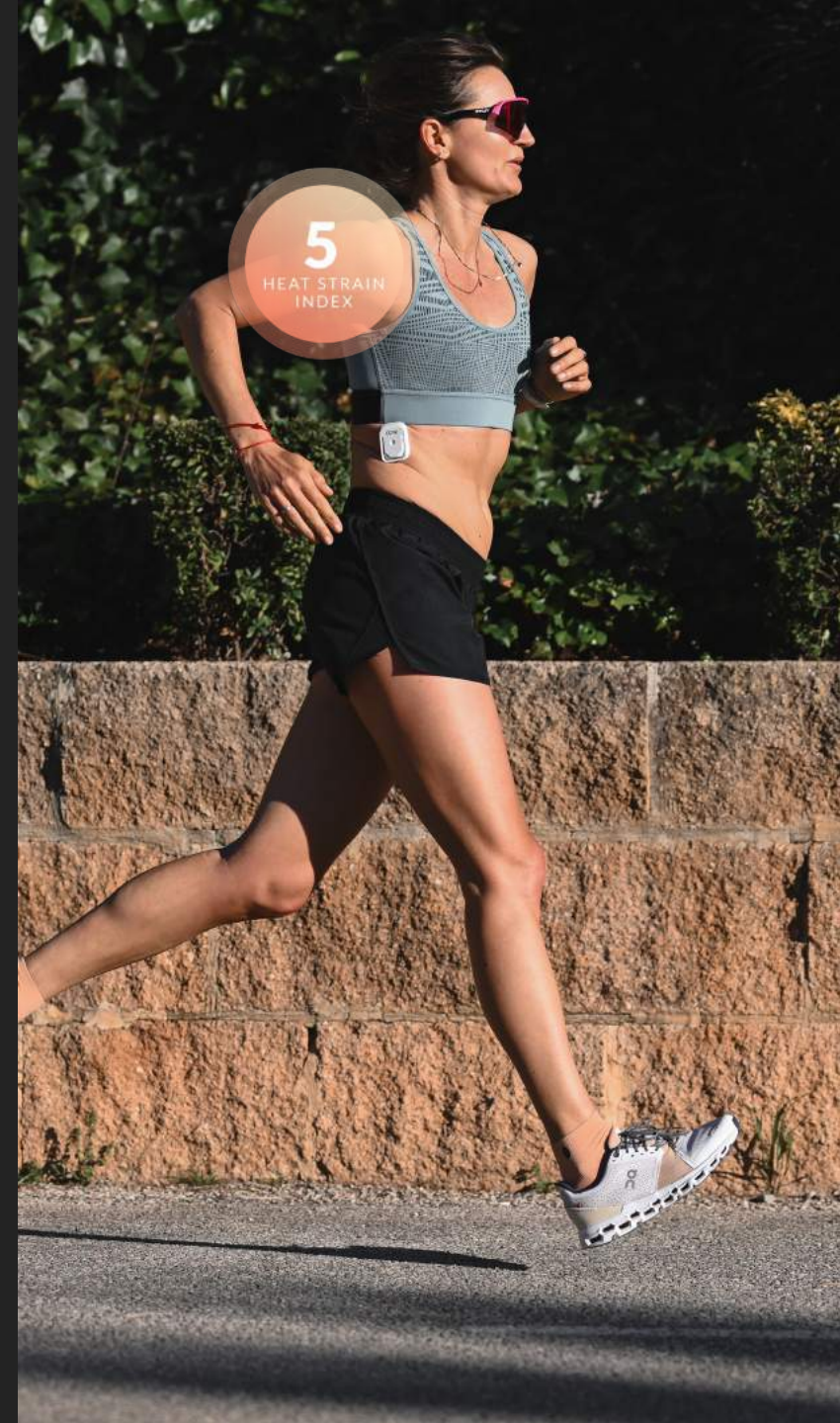
**Benefit:** You'll be prepared to train and race in hot climates.

## 03

### Strategic Cooling

**Benefit:** You'll learn to cool yourself well before your performance declines.

THERMOREGULATION IN SPORTS



# First, Some Definitions

## Core Body Temperature

The temperature near internal organs in the torso. Core temp fluctuates within a narrow range throughout the day and night.

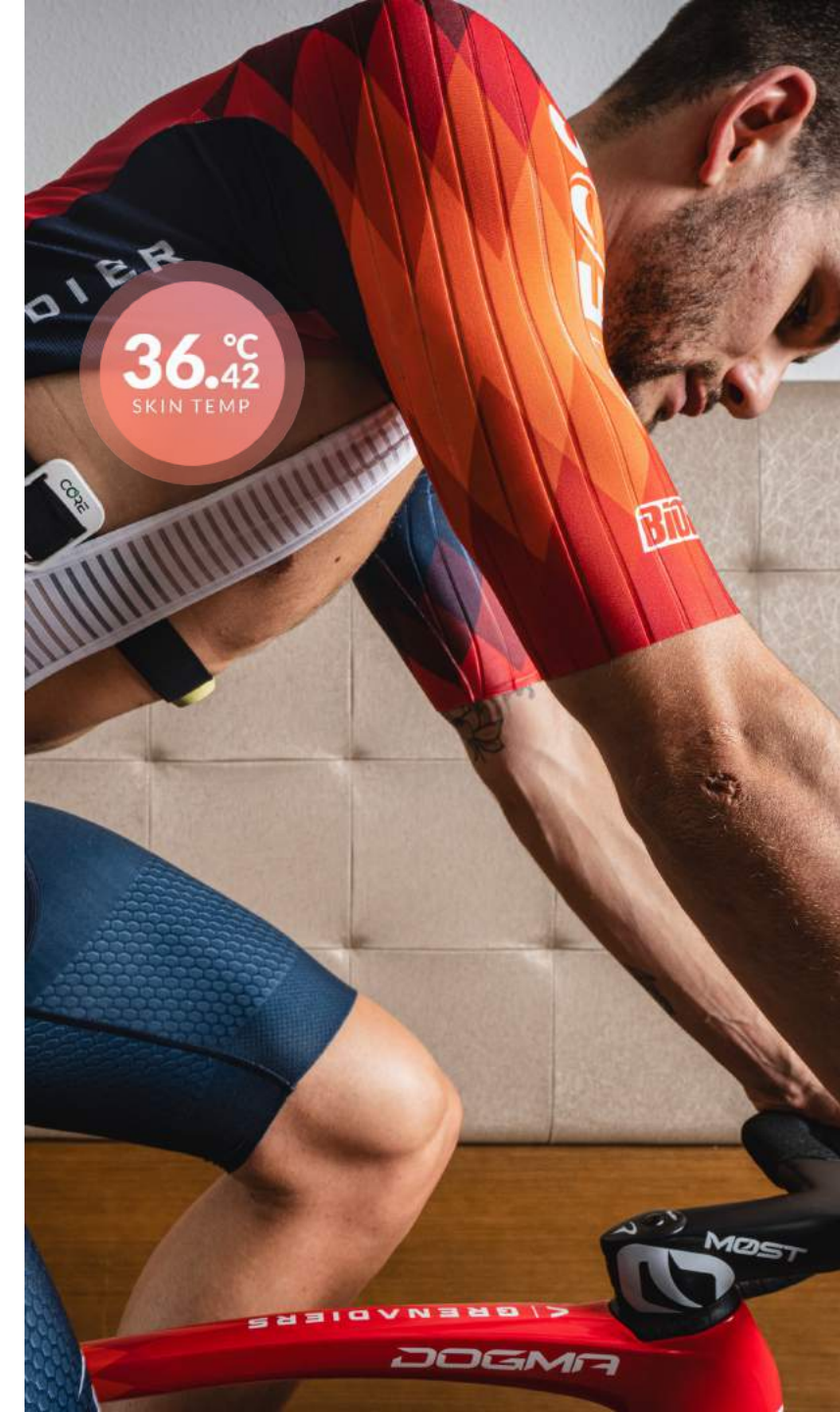
## Skin Temperature

Varies widely depending on environmental conditions. This is the temperature we sense when we experience being hot or cold. It often does not reflect core temperature.

## Heat Strain

The physiological processes that cool the body. The harder the body works to cool itself, the greater the strain, and the greater the impact on performance.

THERMOREGULATION IN SPORTS



# Next, Some Basic Concepts

We generate power from our muscles by burning calories.

But that process is very inefficient – only 20% of calories burned go toward muscular power.

The rest convert into heat energy.

THERMOREGULATION IN SPORTS



# For Example

**200<sub>w</sub>**

If you generate  
200 watts at  
the pedals

**800<sub>w</sub>**

You generate 800  
watts of heat inside  
the body

That heat must go somewhere, and it can't  
radiate straight out of your legs.



# How the Body Cools Itself

01

When your core temperature gets too high, the body starts to cool itself.

02

It sends more blood to the skin, where heat can be easily radiated into the environment.

03

If you get enough heat, your skin starts to sweat.

04

Evaporating sweat cools the skin and blood beneath it.



# How Core Temp Rises

01

Blood circulating through the muscles absorbs the heat and carries it back to the heart.

02

That heated blood is circulated through the body and the heat is dispersed into organs and other soft tissue.

03

This raises your core body temperature.

THERMOREGULATION IN SPORTS





# Skin Temperatures

## Low Skin Temperature

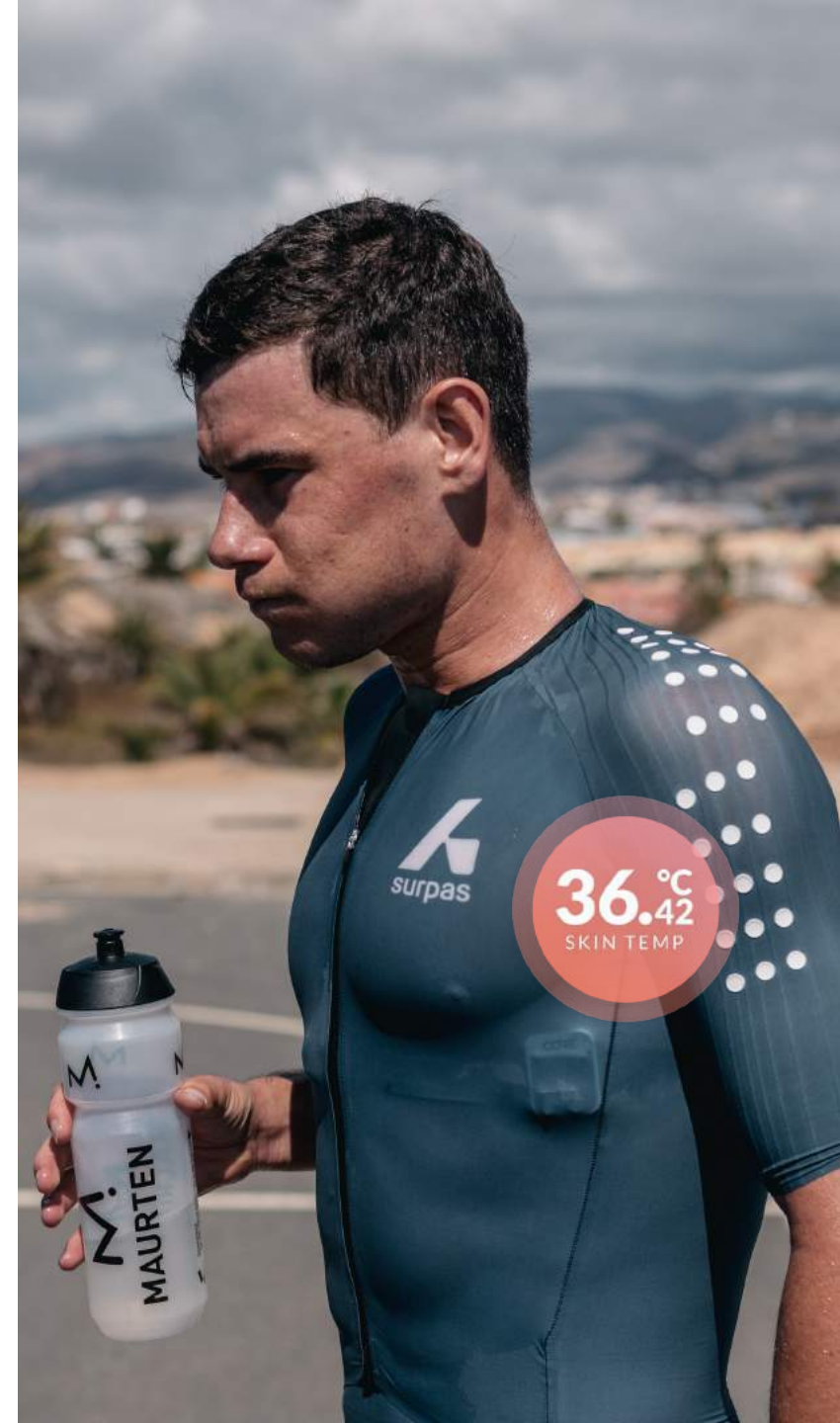
Cool skin can extract heat from blood very quickly. So little blood is needed at the skin to disperse the body's heat.

## High Skin Temperature

But when skin temperature is high, the heat extraction is much slower. A large volume of blood must pass by the skin to get good cooling. So, the body must divert some blood away from the muscles and send it to the skin. Which means the muscles get less oxygen (which is needed for power generation).

This is **HEAT STRAIN**, and it hurts your performance.

THERMOREGULATION IN SPORTS

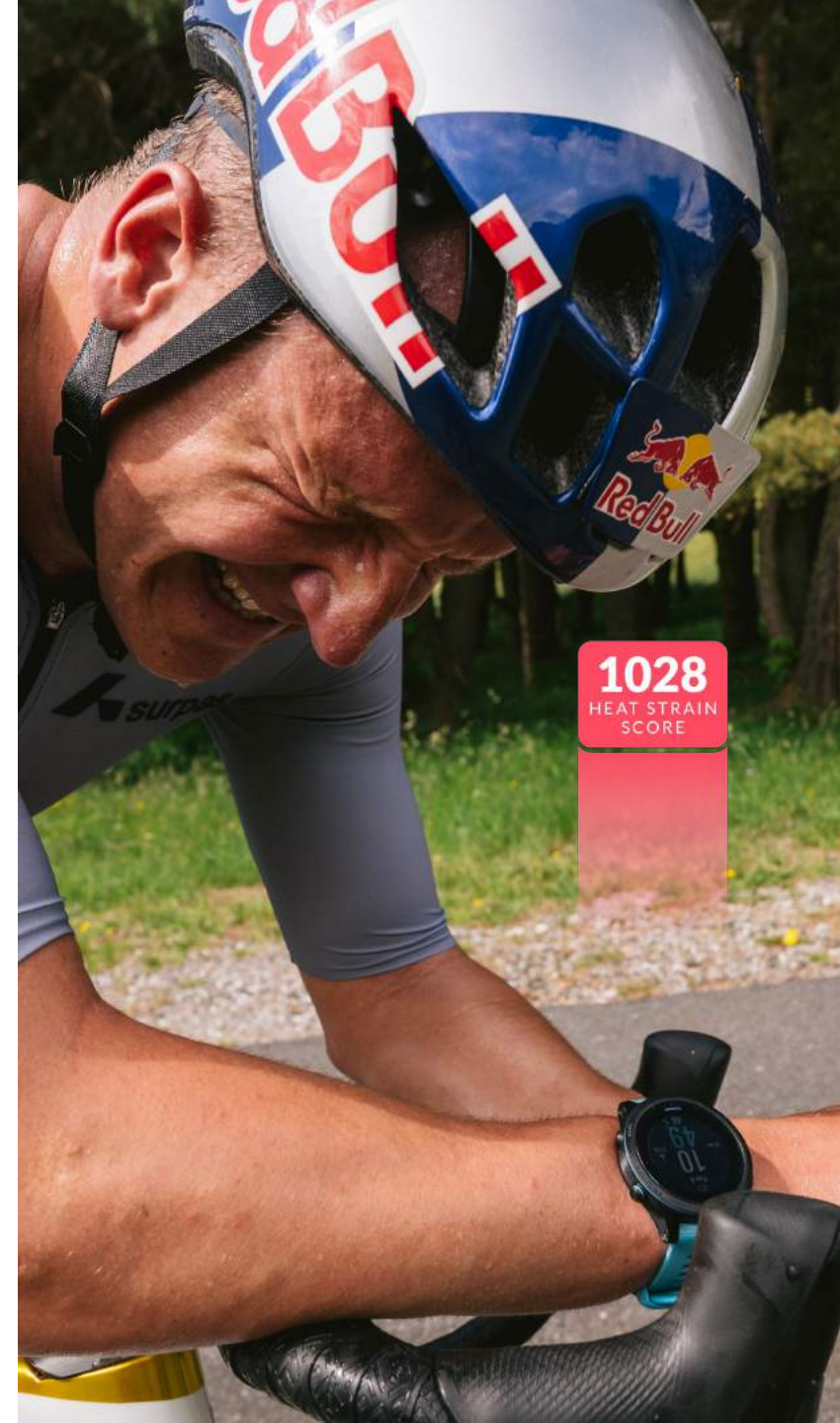


# Heat Strain

Under high **heat strain**, the heart must work hard to send blood to both the muscles and the skin.

- If you keep the same heart rate, your power will decline.
- Or if you maintain your power, your heart rate will increase.

This is called heart rate decoupling.



# How Core Body Temp Is Affected

## 01

### Core body temp is stable at rest.

- Core temperature rises very little due to the air temperature alone.
- If you are at rest in direct sun (30°C/86°F), your skin temperature will rise, you will sweat, and you may feel hot. But your core temp will remain quite constant.

## 02

### Core body temp rises during activity.

We generate a lot of heat when we exercise. The body tries to cool itself to maintain a stable core temperature, but it cannot keep up during strenuous exercise (in almost any weather conditions). This causes core temperature to rise.

## 03

### Weather can impact core body temp during activity.

- The weather is like a set of blankets that traps the heat generated inside you.
- Each 5°C/10°F rise in air temperature is like adding another blanket.
- Each 5% rise in humidity is also like adding a blanket.
- High humidity means your sweat can't evaporate, so your skin does not cool.

# How To Cool More Effectively

01

**Cool your skin temperature.**

- Water dousing/misting
- Ice in your jersey/hat
- Sweat evaporation
- Wind (increases evaporation rate)

02

**Hydrate adequately to maintain blood plasma.**

03

**Increase your blood plasma.**



# Training vs. Racing



We race with a very elevated core body temp.



But most athletes train with only a slightly elevated core body temp.



Physiological adaptations occur when training with a moderately high core body temp.

# Increasing Blood Plasma

Blood plasma can be increased through heat training.

Increased blood plasma allows more blood to be sent to the skin for cooling without decreasing the amount of blood available to the muscles.

THERMOREGULATION IN SPORTS



# Benefits Of Heat Training

01

Increase blood plasma

02

Sweating at a lower core temperature (lets you start cooling earlier, before you heat up)

03

Increased sweat rate (more sweat means more evaporation and greater cooling of the skin)

04

Greater vascular coordination – the body diverts the optimal amount of blood from the muscles to the skin.

THERMOREGULATION IN SPORTS



# Benefits Of Heat Training

Remember how hot & humid weather is like a bunch of blankets trapping your heat?

Heat training is like kicking off a bunch of those blankets.

After heat training, your body will cool itself in 30°C/86°F weather like it used to in 25°C/77 F weather.

THERMOREGULATION IN SPORTS





# Benefits Of Heat Training

After building blood plasma through heat training, hemoglobin will also increase.

This means more oxygen is delivered to the muscles at a given heart rate.

This increases power.



# How To Do Heat Training



## Old-School Method:

- Wear a lot of clothes and run in the mid-day sun.
- "Cook yourself but don't overcook yourself."
- High risk of heat exhaustion or worse.
- Few knew if they were doing it right.



## Modern Precision Method:

- Elevate your core body temperature and skin temperature into a precise range for a predetermined duration while monitoring those temperatures in real time.
- Safely gain adaptations without wearing yourself out.





# CORE Body Temperature Sensor

An accurate, non-invasive wearable device that continuously measures your core temperature, skin temperature, and Heat Strain Index.

Displays real-time data on your sports-tech device.

# Why Monitor Core Body Temperature?

Heat Training

Heat Adaption

Strategic Cooling



## Heat Training

Top athletes do season-long heat training. They get heat adaption benefits and the benefits of increased hemoglobin and power. This lets them train harder and get even stronger.

# Why Monitor Core Body Temperature?

Heat Training

Heat Adaption

Strategic Cooling

THERMOREGULATION IN SPORTS



## Heat Adaption

Some athletes do not want to commit to season-long heat training. But they can do several weeks of heat adaption before a race.

They will more easily shed the heat they generate while racing, regardless of the outside air temperature. This means less heat strain and higher performance.

**CORE**

# Why Monitor Core Body Temperature?

Heat Training

Heat Adaption

**Strategic Cooling**

THERMOREGULATION IN SPORTS



## Strategic Cooling

Even athletes who don't want to do heat adaption can benefit from monitoring core temp and heat strain.

They learn how to cool themselves, and to time it so their performance doesn't decline.

**CORE**



**Are you ready to optimize your  
thermoregulation and perform your best?**

VISIT [COREBODYTEMP.COM](https://corebodytemp.com) TO LEARN MORE AND START STRAINING WITH CORE.