

USING COLD WATER IMMERSION TO IMPROVE YOUR MENTAL AND PHYSICAL HEALTH



Introduction



Hey!

I found the cold first in late 2018, via the Wim Hof Method (WHM), and it was bloody awful. I hated it. And yet I knew it was right for me, that it would become something important for my health. After multiple WHM experiences, including Poland with the man himself, cold water immersion has become part a of my life, culminating in forming Brass Monkey late in 2020. Ice cold water became a critical mental health tool for me, and now I cannot imagine life without regular ice cold dipping!

Introduction

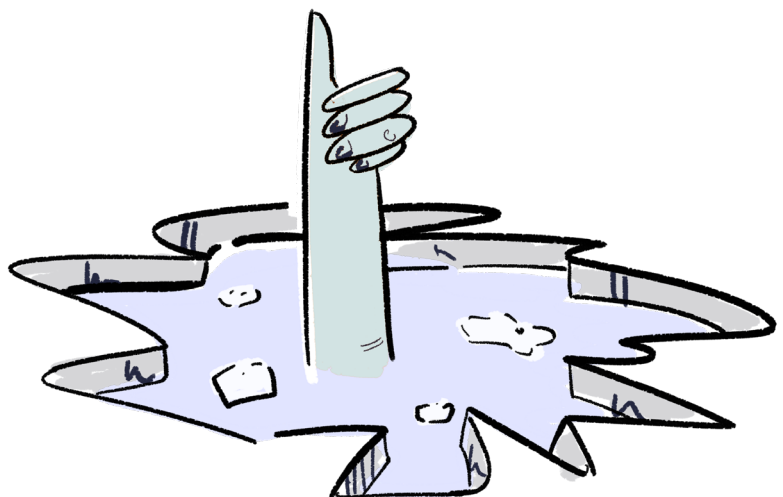
I wanted to know why though, to find the evidence and science behind my experience, I couldn't find a single source of free information where I could learn about the impact of deliberate cold exposure on mind and body and then understand what to do with it. I inadvertently wrote this guide as a result of saving multiple links and making lots of notes, storing information as I found it. And after getting asked lots of questions about deliberate cold exposure and using ice baths, I decided to then take some time to turn those notes into something other people might find helpful. So here it is.

I'm not a scientist, nor do I claim myself to be some form of cold expert, far from it. I've just collated many credible sources that demonstrate that a practice of cold water immersion is unequivocally good for us. I've then, with the help of our customers and my experience with the Wim Hof Method, sought to offer ideas on how to apply it. My key sources to map the terrain continue to include Wim and the Wim Hof team, especially Daniel Kluken, Dr Rhonda Patrick, Prof. Huberman, and a hat tip to the first person to open my eyes to cold exposure, Tim Ferris.

This guide is forever a work in progress, I will improve it several times per year, so if you find better information to share here or perhaps things that you want to question, then please email me at dce@brassmonkey.co.uk

Remember that you are in control in the cold, so choose good decisions, take it slow, be sensible. And above all, keep it fun, I wish I'd understood that much earlier! Every practise can leave you with new insight and a smile, if you let it.

Here's to your health!

A handwritten signature in black ink that reads "Dan".

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Part 1

WHY IS IT SO IMPORTANT TO GET OUR COLD ON?



■ Why is everyone talking about cold water immersion anyway?

Cold exposure demands that we step outside of our comfort zone. Challenging our minds and bodies is how humans have evolved for millennia. It's an ancient practice. From modern cold-water swimmers to ancient Spartan soldiers, Navy SEALs, philosophers, monks and mystics, cold water immersion has powered-up minds and bodies from different cultures and countries throughout history.

Today, we are smothered by the comforts of modern life. With endless options to stay warm from central heating and climate-controlled working environments to fashion focused ways to block out the cold from head to toe, it's no wonder we're programmed to hate the cold. We've literally engineered it out of our lives. We're taught to fear it and in doing so, we have lost the benefits and lessons that it once gave us.

CWI DRIVES A

530%

increase of norepinephrine and the triggering of the sympathetic nervous system



Part 1

At Brass Monkey, we want to change that. We want to share the incredible benefits of the cold for the mind and body. We want to share the science behind how it works and how to start harnessing the power of the cold so we can begin to evolve ourselves beyond what we have become.

■ So just how cold is cold?

When we say “cold”, we mean anywhere below 16°C (as referred to in the studies that we reference). A typical “ice bath” (cold water with ice added later) is 5-10°C. Our ice baths can be set between 0-10°C. It has to be cold enough to be uncomfortable, to create a feeling of “S*it, I need to get out, but I can stay in safely”. Only you know what that feeling is like, and it’s personal to every individual. Your threshold of discomfort will get higher as your tolerance increases. Always keep to the simple rule of seeking out ‘uncomfortably cold’. This will also change by time and by day based on your mental state, level of tiredness, after a workout, or sauna etc. For example, evening cold showers are typically harder than morning showers. Cold showers after a bout of illness can feel harder than before you fell ill. Common sense always applies.

■ The word ‘deliberate’ matters.

This is a guide for deliberate cold exposure (DCE) with a focus on cold water immersion (CWI). By ‘deliberate’ we mean fully and intentionally immersing the body in cold water in order to gain health benefits. It matters in how our mind and body connect. Our mindset changes our beliefs about something we do and how it affects our physiology. There is a difference between something we choose to happen to us versus something that happens to us that we don’t want or expect. Belief even changes our biochemistry. Check out Dr Bruce Lipton if you wanted to know more on that.



CWI: It goes by many names.

Cold therapy, cold thermogenesis (which technically is the term used for the process the body uses to get warm), cold water immersion (CWI), ice therapy, ice baths (even when they don't have ice in), or cold plunge.

The science out there supports CWI, it does not meaningfully support cryotherapy or cold showers in great volume. In this guide, our focus is on CWI, but we'll use broad terms such as 'cold exposure' interchangeably to mean CWI.

■ Know your “Why”.

It can sound a little 'new age' when someone says, 'know your intention', but in the case of cold-water immersion, it's very useful. For some, the cold is simply a tool. For others it's a way of reducing inflammation after intense exercise. For many of our customers it's pain management or keeping symptoms in check. It's also a mental health aid for those who find respite in the kick of norepinephrine generated from the cold; the evidence suggests it builds their mental resilience. Your method doesn't matter. What does matter is knowing your “why”. This will encourage you to stay committed and to help measure its effects on your mind and body.

■ It's about your journey.

Cold exposure can be a part of your journey to build a stronger mind and body consciously and measurably. So, take it slowly. CWI as a therapy is a practice. If it doesn't leave you with a 'wow feeling' then you are probably missing the benefit. Yes, it should be challenging, uncomfortably cold, and it can be kept fun - it's important that it is!

It's your responsibility to ensure you're doing it safely and, you must know your own threshold, and you can only do that by experimenting. So please, be cautious at first. Focus on cold showers or 'warmer' bodies of cold water (10°C or over).

Always apply common sense. Diving into an icy lake is not a good first step, though this is something you can absolutely work towards, and much faster than you think. Whenever you push your boundaries, it can be wise to have a buddy in attendance who can be on standby if needed.



Part 1

■ It comes in many forms.

There are so many ways to embrace the cold. Cold showers, ice baths, cryotherapy, open water bathing (if cold enough). According to science, the top 3 most effective methods are:



Cold water immersion

Including, but not limited to, ice baths, any body of water.



Cold showers

Either after a warm shower or straight in.



Outside (skin to air)

In cold enough environments with minimal clothing (shorts / thin vest).

CWI is the most researched and is therefore thought to be the best method. Why? Heat is transferred four times faster through cold water than cold air and so leaves your body four times quicker. Showers are a combination of the two, so the logic is that if you can't get in a body of cold water safely then showers are the next best option. We advocate getting the cold any way you can. There are no hard and fast rules to. Experiment, see what works for you.



DO SOMETHING
THAT YOUR BIOLOGY
WILL THANK YOU FOR:
**THE HORMESIS
PRINCIPLE AND THE
COLD AS A EUSTRESS.**



■ **Not all stress is created equal, beware cortisol.**

When we say ‘stress’ we usually think of life stress. Money worries, a job, relationship problems, children causing havoc. The list goes on. Chronic and persistent levels of cortisol in the bloodstream can cause serious mental and physical health problems. Tackling these usually requires fixing the cause and/or our response to the cause, which is why exercise and meditation can provide some remedy, even when we’re in the thick of it.

■ **Introducing eustress (or ‘good stress’).**

When an acute stress (a stress that in high doses would be dangerous) is delivered in high intensity for a short period of time e.g. a heavy resistance workout, an intense hill climb or a HIIT workout, this can be considered a good stress or a eustress. DCE falls into this eustress category. The cold has a unique quality that sets it apart from the other examples. Cold exposure is a stress that doesn’t trigger the release of cortisol but does increase your production of noradrenaline and adrenaline, the chemical signatures of stress. We’ll explore this more later.

■ Hormesis = Evolution

The principle of using a eustress, is to become stronger through the process of hormesis. For example, by doing 10 push-ups a day, you'll likely work up to 20 a day by the end of the month. Maybe even 100 by the end of the year. Our bodies use the stress to adapt. As Neitchze said, "what doesn't kill us, makes us stronger". Hormesis was part of our evolution. It's based on the idea that a stressor powerful enough to kill us, applied in a short-term burst, will leave us stronger. Without us knowing, our bodies adapt, readying us for next time.

As privileged and molly-coddled, middle-class westerners (for the most part), we live in modern steady state heated environments (around 22-23°C) all year round. Most likely not moving our bodies enough, not stretching enough, breathing with a poor technique. It's not a great picture. All this leaves the body wide open to metabolic diseases. The cold is arguably the most potent of all hormetic stressors. In a high dose it will reliably kill us, but only recently is the science now supporting its value in short term doses, as a eustress.

HORMESIS WAS PART OF OUR EVOLUTION. IT'S BASED ON THE IDEA THAT **A STRESSOR POWERFUL ENOUGH TO KILL US, APPLIED IN A SHORT-TERM BURST, WILL LEAVE US STRONGER.** WITHOUT US KNOWING, OUR BODIES ADAPT, READYING US FOR NEXT TIME.

■ Why does the cold work as a powerful acute stressor, above all others?

Put simply, it's a reliable and easily measured stressor.

The cold reliably triggers stress chemicals to be released, it's why Navy Seals and SAS training use it above heat and alongside physical training. Nobody can avoid its impact. And, it can be reliably measured through the release of norepinephrine (also referred to as noradrenaline), epinephrine (also referred to as adrenaline), as well as dopamine.

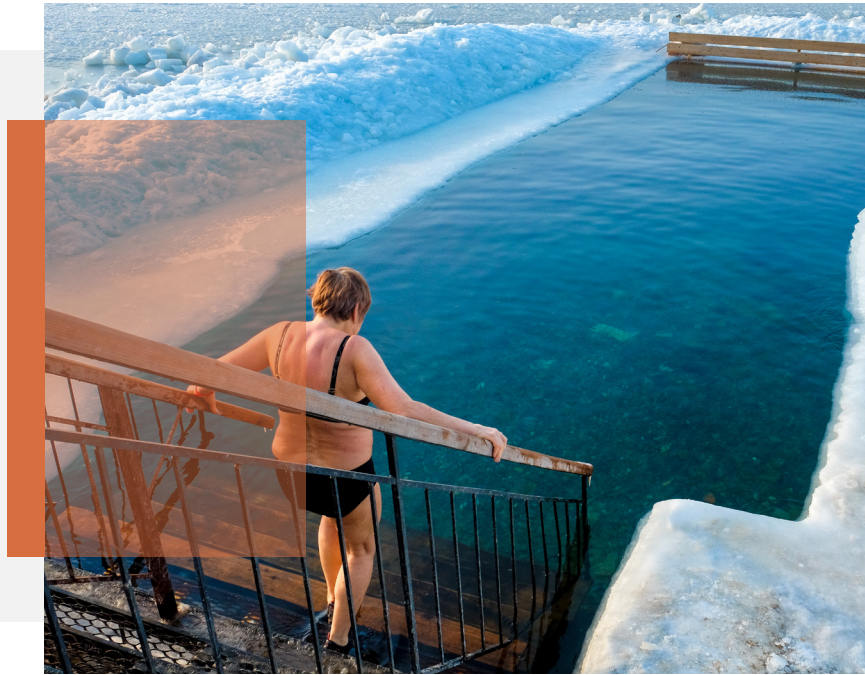
In fact, noradrenaline and adrenaline are the unique chemical definition of stress and it can be easily observed in cold exposure because they are released in such high quantities – up to a five-fold increase to be exact. This happens whether the exposure is deliberate, or not.

These chemicals are responsible for drive, desire and focus. Norepinephrine acts as both a hormone and a neurotransmitter. As a neurotransmitter it's getting us mobilised and ready to move, waking us up. As a hormone it's priming our metabolism for heat conservation and production. Cold water exposure co-releases norepinephrine alongside dopamine - often misunderstood as a “happy hormone” - which is in fact a motivation molecule. It is a reward for pursuit, designed to make us do it again. It makes us feel good. It's why people may say “cold showers are tough but I always feel great afterwards, I love it!”. Collectively, this group of chemicals are called catecholamines, and literally nothing triggers them together like CWI.

■ Minimal cortisol increases.

Catecholamines are reliably released in high quantities in the cold. But what makes it more interesting is it does it with minimal cortisol increase making it such a good stressor, a eustress. Cortisol is a stress hormone designed to initiate the ‘fight or flight’ response. It increases heart rate and blood pressure (and we don't want too much of that). Perhaps it's nature's signal that we're meant to use DCE, just like we use exercise, as a regular eustress to stay healthy.

COLD WATER DIPS WILL INCREASE LEVELS OF CATECHOLAMINES WITHOUT RAISING CORTISOL LEVELS



■ All systems go.

When we step into the cold, changes are triggered in our nervous, immune, endocrine and the cardiovascular systems. Using breath-work (such as the Wim Hof Method) can advance this influence even further, adding the respiratory system to the list and temporarily altering our biochemistry, with or without adding cold exposure.

The brain and the body are one system, even though we don't often see it that way. It's why that post-exercise feeling is great, due in part, to the release of endorphins. This idea matters enormously to DCE, and understanding how our body does what it does, not only to regulate our temperature but to help us build stronger bodies systematically and simultaneously with stronger minds. We decide to enter the cold and decide to adapt to get through it. And so, our body responds knowing exactly how to adapt. We've done it for millennia. As Wim Hof says, "We're the captains of our ship!".

The cardiovascular system consists of 60,000 miles of tubing (2.5 times around the globe) that the brain controls by closing and opening veins, capillaries, and arteries through smooth vascular muscles. Though these muscles are no longer trained in most of us, they can be trained by cold exposure to function more efficiently. DCE can also provide a targeted workout in a focused and troublesome area e.g. extremities like your hands and feet, or whole body if applied through CWI.

■ How your body manages the cold.

Thermogenesis is the body's temperature regulation. It's the process of our body keeping us alive. Here's a basic introduction:

The brain and body work together to regulate our temperature through hormones and neurotransmitters. Everyone has an internal thermostat that sits just behind the nose. This thermostat receives signals from receptors from our skin and inside our body. The signals tell the thermostat to release hormones and chemicals to help us adapt and, in very simple terms, stay alive. DCE trains our thermoregulation to become more efficient, and ready for next time.

The body has limited choices to warm up:

1. mechanically, where we shiver to burn glucose in the muscles
2. metabolically, by stoking the furnace and burning brown fat (energy dense fat)

Both 1 and 2 can occur at the same time and happen alongside vasoconstriction. This is when blood vessels constrict to drive greater blood flow to the core, away from the limbs. The more we adapt to the cold, the more it changes our metabolism to burn brown fat, the more we can change our biology over time.

NOREPHINEPHRINE
IS THE
MASTER MOLECULE

**TURNING WHITE (STORAGE) FAT
INTO BROWN (FUEL) FAT.**

■ We can train to be fat burners.

DCE is responsible for changes to our metabolism, both immediately and for hours afterwards. Burning brown fat is the body's most efficient way to get warm. Think of it as a fuel, ready to fire up the furnace fast. What's often missed and important to remember is that there are ongoing adaptations happening inside the body following DCE, where the body is preparing to burn more brown fat stores for next time. More to come on this in the next section.

IMPORTANT: USING THE COLD TO COOL DOWN

When we get hot and attempt to cool down in common ways, such as draping a cold, wet towel over the head or body, we actually make ourselves warmer rather than cooler. This is because the body's response to prevent excessive cooling is to warm up! Instead, if we cool off via the glabrous skin (hands, feet, cheekbones) the structure and nature of veins in those areas mean we will cool off far more effectively. Cooling the whole body is like flicking on the switch for our central heating. Something to keep in mind for sleeping when it's hot, as well as more serious cases, such as someone suffering from heat exhaustion.

■ The cold and our circadian rhythm: Timing your dips.

Use of cold exposure affects our naturally fluctuating temperature change which is aligned to our individual circadian rhythm. Our body temp is lowest about 2 hours before waking whereas its natural peak is early to mid-afternoon, before slowly declining again before sleep. Our cooling body is what helps fall asleep and why a cool room for sleeping aids a deep rest. This is useful to know for users of cold-water immersion because it can inform what kind of DCE we choose, and when best to take it. A night-time ice bath is much more likely to be counter intuitive to restful sleep as it will warm us up when our body wants to cool down. An ice bath in the morning, however, is going to support the body in warming up when it already wants to do that. Be sure to see what works for you!

■ The cold makes us want to come back.

How? DCE creates a big uplift in dopamine, the motivation molecule. This is particularly interesting because other stressors that also increase adrenaline and noradrenaline, do not lift dopamine levels. People use the cold to shift their body state and change their mind. This is in no small part down to dopamine which can be increased by 230% through CWI. Perhaps most interesting, is that CWI comes with the ability to significantly elevate mood for many hours after the cold exposure took place.

Dr Anna Lemky (Dopamine Nation) references cold water exposure as a way that she has observed patients to help themselves swap negative, bad habits that offer a dopamine hit (alcohol, drugs) for a much healthier cold-water habit that provides the same hit they seek.

What we can see here is a clear theme, increasing catecholamines (epinephrine, norepinephrine with dopamine) will sharpen mental acuity, bring focus and lift mood. Those benefits can be experienced for hours, not minutes, after CWI. No wonder the cold is habit forming!



Part 2

UNDERSTANDING HOW COLD WATER THERAPY BENEFITS US

■ How our bodies detect and react to the cold

As we've already explored, the growing evidence indicating that cold exposure affects multiple organ systems, eliciting beneficial effects on aspects of metabolic, cardiovascular, immune, and neurocognitive health, among others.

We've learned in the last section that cold-water immersion does this through a reliable and non-negotiable surge of catecholamines (norepinephrine, epinephrine and dopamine) no matter how well cold adapted you are, this release happens each time you're exposed.

Before we get into the increasingly understood benefits, it's important to highlight just how central norepinephrine is to these benefits. Norepinephrine (the hormone and neurotransmitter) is produced in the adrenal glands, some areas of the brain (the locus coeruleus) and even from the skin's surface directly into fat cells. It's the orchestrator of most of the health benefits.

Norepinephrine is the key trigger.



Increases heart rate and blood flow



Modulates immune function



Activates thermogenesis (the production of heat)



Constricts blood vessels to the body's core



Induces a protein, a key regulator of our genes involved in energy metabolism called 1-alpha, or PGC-1 alpha. PGC-1 alpha is worth commenting on, it participates in glucose and fatty acid metabolism, muscle fibre remodelling, mitochondrial biogenesis (the production of new mitochondria), and thermoregulatory function.

■ The benefits for brain health, mental health, mood and mindset

The fact that cold exposure (deliberate or not) will see our body reliably release a flood of catecholamines is what makes it a good stressor to play with for brain and mental health. This flood of catecholamines (primarily adrenaline and norepinephrine) is a chemical definition of stress, and it happens to varying levels every time you get into the cold. The opportunity is to use it!



RBM3: THE COLD SHOCK PROTEIN HELPS TO PROTECT AND RE-GROW THE PARTS OF THE BRAIN.

Cold water therapy and brain health

Out of all the health benefits that cold water therapy is now becoming proven to support, perhaps the most stunning is in its potential to both protect and re-grow the brain, specifically the repairing of synapses and the regeneration of neurons. The potential being to support in strengthening against neurodegenerative diseases (such as Alzheimer's and Parkinson's), cognitive decline basically, whilst offering protective effects against brain injuries. Surely this is something worth shouting about? Research involving cold exposure and brain health highlights a protein that can be targeted to prevent and slow progression of the disease.

CWI and cold shock protein RBM3

When your body is exposed to the cold, the cold shock releases a protein called RBM3: RNA Binding Motif 3 ^[1]. These proteins are directly linked to the regeneration of synapses in the human brain. Synapses are gaps between neurons through which our neurons communicate, and are responsible for normal brain function and how we form memories. This effectively means that cold water therapy could play a role in decreasing the degeneration of our neurons, and therefore support people in preventing neurodegenerative diseases ^[2] because it promotes the growth and development of nervous tissue and neurogenesis.

RBM3 the brain healer

Found in human heart, liver, skeletal muscle and brain tissue, RBM3 is able to stimulate damaged or degenerated synapses. And, the more of this cold shock protein there is in your brain, the better the effect. Whilst synapses can be damaged and disappear, especially as we age, studies have revealed that RBM3 interacts with neurons where they connect to synapses and boosts their productivity^[3]. RBM3 has been shown to not only repair and regenerate synapses, but also rebuild neurons, preventing cognitive decline. This protective effect for both neurons and synapses has been demonstrated in multiple animal studies where RBM3 is in play^[4].

Improving brain function

Alongside RBM3, we know that norepinephrine release is also important for a cascade of health benefits. After all, decreased norepinephrine is associated with decreased focus and cognitive ability, low energy, brain fog, and poor mood (generally), as well as depression. Norepinephrine levels increase considerably up to 530% within minutes, through cold exposure. Acting as both a hormone and as a neurotransmitter, norepinephrine has been shown to enable synaptic plasticity^[5], whilst participating in the regulation of cortical circuits (grey matter), cellular energy metabolism, neuroplasticity and inflammation^[6].

THROUGH COLD WATER IMMERSION
WE'RE ABLE TO IMPROVE BRAIN HEALTH,
THE HEALTH OF THE ORGAN ITSELF, WHERE THERE
ARE NO CURES OR CLEAR PROTOCOLS FOR PREVENTION.
**PERHAPS A HEALTHIER FUTURE AWAITS FOR THOSE
PREPARED TO INVEST THEIR TIME.**

DCE and mental health

Through the release of norepinephrine into the bloodstream as well as in the brain's main source of norepinephrine (locus coeruleus)^{[7][8]}, it's proving a key player in the mood and cognitive-enhancing effects of cold exposure. As described already, norepinephrine is a neurotransmitter involved in vigilance, focus, attention, and mood^[9]. Generally, lower norepinephrine activity is associated with inattention, decreased focus and cognitive ability, low energy, and poor mood^{[10][11]}. Depletion of norepinephrine can lead to depression^[12]. In fact, both ADHD and depression are sometimes treated with norepinephrine reuptake inhibitors, but these drugs carry some risks^[13].

When adults diagnosed with depression underwent just 10 cold therapy sessions, they showed marked reductions in their depressive symptoms and improved quality of life, mood, and disease acceptance. This suggests that whole-body cold therapy is beneficial for mental well-being and quality of life^[14].

Findings from a case report suggest that a cold shower for 2 to 3 minutes can relieve depressive symptoms when performed once or twice daily over the course of several weeks and months^[15]. A separate case report demonstrated that cold water swimming once or twice a week improved mood and reduced depressive symptoms in young women^[16]. These reports are anecdotal and involve swimming as a form of exercise, which of course, can also add to the benefit.

JUST
10 COLD WATER THERAPY
SESSIONS SHOWED
IMPROVEMENTS IN
DEPRESSIVE SYMPTOMS

Part 2

What about resilience building and strengthening your mindset?

For building a stronger mind, it's important to face the cold stressor and maintain a deliberate and directed focus. By doing this you are actively developing resilience, or what we sometimes call "grit". We can take this ability to face and manage stress of the cold into the stressful situations we experience in everyday life. These everyday stressors show up in our physiology with the same flood of catecholamines (this is different to ongoing chronic stress which shows up in elevated cortisol levels). We can demonstrate increased resilience through repeated exposure, without the negative rise of cortisol behind chronic stress.

What is resilience?

Resilience is the ability to resist escaping from a (cold) stressor. Not quitting, by virtue of willpower, top-down control over our body and resisting the reflex to jump out. The more we learn to manage the flood of catecholamines and the feelings they evoke the more we build resilience through improved willpower— useful for life outside of the ice bath or cold shower.

We experience the release of these surges of catecholamines as feelings that come in waves, that we can learn to overcome in both the cold and in life. The level of the release of the catecholamines will vary by individual and by day, time of day, method (shower, river, bath) and of course, by temperature.

■ The benefit of cold exposure for metabolism and weight loss

Cold thermogenesis has been shown to activate brown fat immediately and boost the metabolism for several hours after the exposure has ended. However, cold exposure isn't a magic answer to weight loss. A healthy diet and increased exercise are the first ports of call here. However, layering in cold exposure as a third pillar to ensure the metabolism is working to burn fat throughout the day is unquestionably a good idea, if you're up for it.

Cold water therapy for improved body fat.

The activation of thermogenesis (burning brown fat), in people with obesity or type 2 diabetes may be an effective therapeutic strategy to aid in weight loss and improve metabolic health [18]. People with higher percent body fat typically have less brown fat. However, cold exposure increases brown fat volume and activation in people with high body fat, by turning white fat into brown. Making it a hot area of exploration for weight management. [19]

DCE improves insulin sensitivity.

A separate study of overweight men with type 2 diabetes found that they had increased brown fat mass and activation with an improved insulin sensitivity after cold exposure. Peripheral insulin sensitivity increased 43% and in turn, muscle glucose uptake also increased. This is interesting because it suggests that cold exposure appears to be a potential therapy for diabetes [20].

DCE TURNS REGULAR
WHITE (BODY) FAT INTO
USEFUL BROWN FAT FOR
THERMOGENESIS.

**A HOT AREA FOR
WEIGHT LOSS.**



Part 2

It is this effect that brown fat appears to have an impact on glucose metabolism, independent of age, sex and body fat percentage that is interesting scientists. In a study where subjects were placed in a cold room while their feet were placed on an ice block (sounds fun!), the group who had stores of brown fat had lower HbA1c (a marker for long term blood glucose control problems) and lower cholesterol compared to the participants who didn't have brown fat stores in their bodies. ^[21].

CWI lowers cardiometabolic risk.

DETECTABLE BROWN FAT LEVELS IS A MARKER FOR A LOWER PREVALENCE OF CARDIOMETABOLIC DISEASE

A retrospective study of more than 52,000 people who had cancer found that people with detectable brown fat had a lower prevalence of cardiometabolic diseases such as type 2 diabetes, coronary artery disease, congestive heart failure, and hypertension than those without detectable brown fat. Although the researchers adjusted the analysis to accommodate the potential influence of cancer and various treatment characteristics, the data was obtained from a population of people with cancer who may already have metabolic alterations due to the disease. Nevertheless, the study implicates brown fat in supporting cardiometabolic health. ^[22]

INCREASED LEVELS OF BROWN FAT INCREASES CORE METABOLISM - MAKING US FAT BURNERS MORE OF THE TIME.

Part 2

Increasing brown fat activation

Recent work by Susana Soeberg^[23] researching young men who are regular winter swimmers revealed that an 11-minute total of cold exposure, per week, increased a number of metabolic processes:

1. The men experience an increased caloric burn, due to increased core metabolism, by going into cold water up to the neck. Covering the vagus nerve (side of the neck) is considered, important to do. Increases in core body metabolism (burning calories), though small, were statistically significant, and only capture half of the story.
2. The more interesting benefit was observed in fat storage over time. The male participants felt more comfortable in extreme cold due to their cold training. This was observed due to the increasing amount of brown fat that DCE creates, converting white fat (which has a low metabolic output) into storage fat, to brown fat (a fuel source), preparing the body for future exposure. This increased the participants' overall core metabolism every day, turning them into fat burners.

This is huge and re-frames how we see the cold. Beyond a one-hit fat burning tool whilst in your ice bath, you're actually changing your underlying metabolism beyond a single exposure.^[24]

This is because norepinephrine (released when we get into the cold) binds to white fat receptors on the surface of white fat cells. There are neurons that sense cold on the skin which directly release norepinephrine into the fat cells under the skin to set off a huge set of immediate and ongoing gene expression changes. Genetically changing the white cells to brown fat cells. It shows us that white fat has a plasticity, and an ability to change should we ask it to^{[25][26]}.

It's amazing to think the fat cells themselves receive messages and can adapt like this.

■ The benefits of CWI and its role in immune strengthening

This particular health benefit claim may have been popularised by a 2016 Dutch study where users of daily cold showers showed a reduction in self-reported sickness ^[27]. Since then, there have been numerous studies showing that cold exposure, typically in winter ice swimmers, increases the plasma levels of a number of different immune cells ^[28]. Quite simply, more immune cells in your blood is generally a good thing.

A study comparing regular winter swimmers who practiced more than once per week to non-habitual swimmers showed that resting concentrations of some white blood cells such as leukocytes and monocytes were higher compared to the non-habitual swimmers ^[29]. Another study found regular winter swimming may decrease respiratory tract infections by 40 percent ^[30]. These studies bolster all those anecdotal claims shared among communities of winter swimmers and cold water enthusiasts that they experience fewer colds and influenza.

The benefits around winter (ice) swimming with temperature in waters below 5°C are perhaps the most numerous and therefore the most cited, and where plasma (blood) levels have been measured objectively. The benefits of ice water exposure correlates to better immune health for reasons outlined below, and perhaps with the added of benefit of the cold exposure being undertaken in nature. Who knows the importance of the 'nature' aspect until detailed studies are explored - but we shouldn't overlook it: whenever it's safe - nature is best.

SCIENCE NOW SUPPORTS
ANECDOTAL CLAIMS
THAT **CWI PROTECTS US
FROM COLDS AND FLU.**



DCE boost the immune system.

We know that cold water exposure appears to boost certain populations of immune cells. When healthy young men were exposed to cold multiple times over a period of six weeks, their CD25 lymphocytes increased after three weeks, while CD14 monocytes increased after six weeks. This is another indicator that the benefits derived from the adaptation that occurs in the body come from repeated exposure, not from the very occasional dip or cold shower.^[31] This isn't a surprise when we all know that doing the odd set of press-ups doesn't make us fit.

REPEATED COLD EXPOSURE INCREASES SPECIFIC
POPULATIONS OF IMMUNE CELLS

Another study demonstrated that cold exposure increased the numbers of white blood cells, specifically a specialised type of immune cell that can kill cancer cells. The white cell counts remained elevated for two hours after cold exposure. The participants' natural killer cells (white blood cells of the innate immune system) also increased^[32], a separate study noted similar findings^[33].

■ Immune strengthening and the Wim Hof Method

Wim Hof and the Wim Hof Method (WHM) are perhaps now increasingly cited in terms of pushing the boundaries of our innate ability to control our immune system, something previously understood to be autonomic, beyond our control^[34]. WHM combines DCE with breath-work and mindset training. In the most famous study of the WHM, subjects who trained for only 4 days were able to suppress their primary (innate) immune response to a bacterial endotoxin that was injected directly into their bodies. Should the WHM be of interest to you? Hell yes!^[35]

Part 2

If you want to stock up on plasma immune cells then cold exposure is certainly worth looking into. If you want to go much further into suppressing inflammation, strengthening immune response and managing autoimmune response then the WHM (cold and breath work) is worth exploring.

It's exciting to imagine what more funded research could reveal in this area given the recent pandemic and learn more specifically how the health of people can be improved, especially as they age.



**“YOU ARE THE CAPTAIN OF YOUR SHIP,
YOU ARE IN CONTROL. SO JUST DO IT.”**

Wim Hof

■ The benefits of CWI for inflammation and performance

It's well understood that cold exposure, whether applied to the whole body or to a single area (e.g. cold packs), has benefits on reducing inflammation.

Chronic inflammation is a key driver of the ageing process often casually referred to as 'inflammaging'. Inflammaging is associated with many age-related diseases, including arthritis^[37]. Inflammation also occurs after periods of exercise. Research indicates that cold exposure most likely decreases inflammation in people with inflammatory conditions as well as in those who have undergone exercise training.^{[38][39]}

Arthritis

Arthritis is an inflammatory degenerative joint disorder that can cause pain and reduced mobility, affecting the lives of millions. Destruction of cartilage within the joints can drive arthritis and there is currently no cure. However, beyond treatments such as pain relievers, anti-inflammatory drugs, exercise, and joint surgery, it appears that cold exposure may be an effective treatment to reduce inflammation and pain associated with arthritis.

Cold exposure may decrease pain in people with rheumatoid arthritis by decreasing inflammatory signalling molecules. In healthy people, five days of cold exposure decreased a pro-inflammatory protein called IL-2, the inflammatory E2 series of prostaglandins, but increased an anti-inflammatory protein called IL-10^[42].

Pain management

Some of the pain-alleviating effects of cold exposure appears to be pretty likely due to the huge increases in norepinephrine already outlined. Since inflammation itself causes pain, reducing that reduces the pain, and the cold itself having an anesthetic effect. In fact, spinal injection of compounds that induce a release of norepinephrine alleviates pain in both human and animal studies.^[43]

Part 2

Exercise associated inflammation

A recent analysis of 52 studies on the use of cold exposure on physical performance have now clarified many outstanding questions for athletes who want to use cold exposure to help them train for performance outcomes ^[36].

- **Strength training.** A recent study has confirmed that the cold's ability to significantly blunt inflammation is something to be managed where strength or hypertrophy exercises (people wanting to build muscle) are concerned^[44]. Growing muscle actively requires inflammation. So, if your exercise goals are muscle building-based, it's best to avoid CWI up to the neck for at least 4 hours after training. That doesn't mean you should avoid it altogether however, since it doesn't appear to apply to cold showers because there are no studies to reference on this point. It's also hard to imagine that a brief cold shower would short circuit the entire strength benefits of a workout. But if you're serious and unsure then the belt-and-braces approach would be to simply leave it for 4 hours before entering cold water in any form.
- **For endurance,** interval training or mobility work the evidence is much more positive immediately after exercise. Through the management of inflammation, cold-water immersion is much more likely to positively reduce muscle soreness (DOMS), reduce serum creatine kinase (a marker of muscle damage), and subjectively the person's perceived recovery 24 hours after high-intensity exercise when compared with passive recovery ^[45]. Elite marathon runners who underwent whole-body cryotherapy after a running session had four times lower C-reactive protein levels (a marker of inflammation), and decreed creation kinase compared to runners who underwent passive recovery. ^[46]
- **Increasing aerobic capacity.** The cold brings a new benefit here. CWI increases mitochondrial biogenesis ^[47]. This means it adds more mitochondria to muscle cells thereby increasing the muscle's aerobic capacity. The practical outcome in simple terms is more muscular power, making it clear why endurance athletes, including elite footballers and rugby players, feel the benefit so much both in terms of recovery and their ability to go again.

The analysis also realised a dose response relationship to endurance exercise meaning that the longer or colder the cold exposure post training the better the recovery. Shorter duration (1-5 minutes) at colder temperatures done directly after training are also the most useful to achieve the benefits.

Part 2

Benefits for everyday exercisers.

So, what does this mean for people whether they are athletes or don't identify as an athlete outside of perhaps a regular HIIT class, Peloton sessions, other cardio activity, yoga or just the odd walk when the kids insist? Well, CWI is unequivocally good for you. It's a very powerful, whole body tool for both reducing inflammation and associated pain. It appears to decrease inflammation in people with inflammatory conditions and in those who have undergone exercise training.^{[40][41]}

The outcome of this is reduced, or no, muscle soreness, and an increase in muscle performance and the ability to feel like you can 'go again'. It's norepinephrine that boost mitochondrial density at a cellular level, enhancing aerobic capacity. The cold further has an anesthetic effect, and though there are no specific studies on this, we know that we're managing the cytokines that reduce pain through reducing inflammation, which is at the core of musco-skeletal pain.

CWI IS DOSE RESPONSIVE; THE

COLDER

YOU GO, THE

LESS TIME

YOU NEED TO BE IN

Part 3

BUILDING A COLD WATER IMMERSION PRACTISE



■ Approach to CWI and protocols for everyday use

We all have a shared biology and it's ready and waiting to be hacked. Of course we all have different levels of tolerance for the cold and that changes depending on the many things we've already discussed so far. But one thing remains certain and consistent; that the cold is good for us and we should be welcoming it into our daily lives with open arms. Understanding how and what's right for you is the next step

■ Cold adapted vs not: What does it look like, what are we aiming for?

Cold adapted people are those who are sufficiently practised in unlocking the deeper benefits of colder water for longer periods. They have common traits:



Their breath remains under control

(they don't gasp as much) upon entering or whilst in the coldest water.

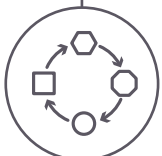


Their circulatory system responds quickly and efficiently.

If they're Caucasian, the skin turning pink quickly is a useful, visual sign of this.



They're not stressed. They feel and look calm and alert - challenged of course - but always comfortable and focused.



They are fat adapted, so there is little or no shivering. They have developed a physical control over the cold stressor.



They warm up very quickly after the exposure.

In just a few minutes they're on with their day.



They display these adaptations in regular cold weather or daily cold situations.

■ The key to success in adapting is consistency

You don't get good at press-ups or handstands, juggling, ju-jitsu, bench-pressing, knitting, playing music or whatever by doing it just once. We know this to be true. CWI is a practise. Show up daily, design it into your routines, reap the benefits.

“The cold is a teacher”

Sometimes just the idea of the cold, or the walk towards the ice bath, is enough to start feeling the release of catecholamines, whereas other days we might need to be in the ice for longer before we feel the stress take hold. We can take the surge of these chemicals and use them. This is why Wim Hof says, “the cold is a teacher”.

We can approach this in two ways.

The two levers:

1) The two levers: duration & temperature

Perhaps start one minute at 5 C, then a few days later add 30 seconds. Alternatively make the water cooler and maintain shorter durations. We can track it and see the progress we make in both duration and temperature. We become measurably stronger. This is how most of us train in the cold because it's a perfectly convenient and sensible way to get started. Focus on nothing else but the timer, and lower temperature over time. However, just working with these two levels is harder to increase our level of adaptation into the future. So, the more we want to grow the practise, the less helpful time or temperature alone becomes.

2) Feeling

Wim Hof calls it ‘interoceptive awareness’. The sense of being conscious of the feelings in your body and mind. Here we can truly personalise the cold as a practise every single time we use it because it will be different day to day. Professor Huberman (Stanford University, see podcast; Huberman Labs) has a great way to think of cold therapy a practise of resilience building. He talks about ‘walls’^[17]. A wall is simply when we can sense the release of catecholamines based on how our body feels in the moment. Tension heightening, heart racing, changes in your breathing, and in turn the breath can be used to manage our body's response. Huberman's ‘wall’ protocol enables us to count the number of walls we choose to face, and then overcome

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them in any one session. The unavoidable gasp when we get in is the obvious ‘wall’ as we face a surge of catecholamines. Maybe you face a wall walking to the ice bath or shower. Count them. More on how to apply this as a protocol in the last section.

How cold?

Uncomfortably cold is always the answer. You must learn to relax into the discomfort. However, there should be no pain and no pushing it, especially if in an uncontrolled environment without a guide (such as a Wim Hof experience led by a tutor). You’ll know if it can be longer next time because, in the end, you will know whether it was easy or not. Trust that feeling, aim for ‘uncomfortably doable’.

Decide your approach. I prefer colder temps for shorter durations of 2-3 minutes. It’s not a hard and fast rule, it’s just how I started, and it suits me. Yet, I know other people are much happier in 5°C for 5+ minutes, relaxing and bathing almost, they want to sit for extended time periods, more akin to wild swimming. Of course, the more you practice, the more you cold-adapt. It will likely transcend time. You start to feel your body and the messages (feelings) it sends you as a guide. Essentially, learn to feel your body respond. It will tell you when it’s had enough, or not enough.

**HOW COLD FOR AN
ICE BATH OR COLD DIP?**

**UNCOMFORTABLY
COLD, ALWAYS**

● **Stay in control.** Set your intention (2 or 5 minutes cold shower, or a 3 minute ice bath for example) based on how you feel on the day. Prepare your environment. Bring your mind to 'now', this is all part of the practise. Be clear how you will exit if it's too uncomfortable. Decide, then do it.

● **Just breathe.** When you're in the water, be there mindfully. Be 'in the room'. Keep focused on your breath. You want slow and controlled inhales through the nose and extended exhales through the mouth. This tells your body to stay calm, that we are all good, that we are in control, there is no fight here. Everyone feels the urge to breathe frantically at first, it's a chemical response (norepinephrine primarily) that is the challenge in even the most adapted practitioners. They use their breath to manage it, and you can too.

● **Use the levers.** Slow and steady wins the race. Why? Because you will always exit enjoying it which means you'll come back and keep adapting. Maybe not adapting as fast as you want, but faster than you could have imagined. Aim for your cold bath to be uncomfortably cold, just play, feel it for the duration you already decided, then get out. Repeat tomorrow.

● **Keep it fun.** A cold practise is fun. We're not trying to break records like Wim Hof! Be amused by yourself. It's not serious so long as you're practising safely. How funny you're sat in cold water! That you know how amazing you will feel in a minute's time. That your friends think you're nuts and tell each other you're a bad-ass.

● **Decide.** On the recent Wim Hof show (BBC's, Freeze the Fear) Wim said many times to participants before they entered the water, "You decide". We easily forget about entering. First decide how you want to feel and how you will get in. See yourself in there, happy. Decide how your body will react. Decide you will smile throughout and decide that you have control over your breath. What's all this? Visualisation. That's about the sum of it.

Exit consciously. The most serious part of cold-water therapy comes at the exit point. You need to be as switched on for the minutes after as you were in there. A chilled feeling is most likely as the blood re-circulates from the extremities, but we don't want extended shivering. Extended discomfort afterwards is unnecessary and a sign of pushing too hard (be that temperature, time or both), warming too fast or not warming consciously. To warm consciously with a gentle cycle on an exercise bike, walk around, or my favourite, the Wim Hof "horse stance". Feel your body getting warmer. Take several minutes at least **before** heading into a warm house or grabbing hot coffee.

Time it well to protect your sleep. We've talked about our circadian rhythm. Morning to mid-afternoon cold dips will align with your natural circadian rhythm. Evening and night-time are much more likely to initiate biochemical changes that will disrupt what your body's natural cooling process to help you fall asleep. Shock cooling the body actually warms us up so not ideal! Anecdotal evidence we've collected reveals that cold showers late in the day don't impact sleep and can even improve it, yet late dipping in an ice bath disrupts sleep for others. It's not hard and fast rules here, so see what works for you.

Know your why. Why are you doing this? For example, a simple mood lift can be achieved in a 30 second dip in temperatures well above freezing. But the more cold-adapted you become and the more interested you are in the deeper benefits, then the more likely you'll need something colder for longer. Is it about mood? Exercise recovery? Mental health and active resilience building? Or a more passive breath work or meditation-like practice? It's all cold, with different outcomes and benefits.

AN APPROACH FOR NEWBIES

1

No ice baths at first.

Just as you don't walk into a gym and attempt to bench press 200lbs for fun. Walk before you run.

2

Keep it fun.

We're not training to summit Everest, it's just cold-water therapy to unlock some health benefits. Smile, keep it playful there is nothing serious about this if we are safe, though you'll enjoy some serious benefits.

3

Start with 30 seconds in a cold shower.

Build up quickly over a week to 1-2 minutes, you'll be amazed how fast you adapt. The aim in a cold shower is to stay in until your breath is under control. Then aim to stay in until it no longer feels cold, at this point you've nailed the cold shower.

4

Time.

Aim to get cold 4-7 days a week, ideally 7, but no forcing if a day off feels important. Even 4 days per week (every other day) for just a few minutes is going to render adaptation.

AN APPROACH FOR NEWBIES

5

Temperature:

Introducing CWI steadily:

- Cold baths first (5-10°C). When you can do 3-5 minutes in the shower and feel great with no repercussions (shivering or vascular issues) then get in a cold bath. Cold water is four times stronger than cold air at extracting heat, so start 'warmer' over 5°C. Try a minute or two.
- When you can do 2-3 minutes in a cold bath, and again feel great with no shivering afterwards, try some ice. You'll feel confident because of your progress. The ice bath is no longer a beast of fear, just a teacher that you respect. Lower those temperatures by 2°C whilst reducing the time (the two levers). Try for a 1 minute ice bath, hands out at first if you wish, then increase over time.
- This end-to-end scaling into cold water can be done as fast as feels sensible to you. A week or a month, there's no rush, and no medal at the end.

Developing an ice bath practise considering temperature, frequency, duration and more.

This is for people who already have some experience with the cold:

- **Consistency** is the #1 key to progress and adaptation in CWI. It takes many exposures over time to adapt. So we encourage making it a practise, part of a routine or ritual, and generally a part of who you are. This is vital to understand, just going in every so often does not render the health benefits but of course will give you the immediate feel-good hit. However you get your cold on, aim for 2+ minutes, 4-5 times per week.
- **Frequency** in cold water in winter swimmers is something recently explored by Dr Susanna Soeberg who's revealed that 11 minutes is the optimum (read, minimum) for weekly cold-water exposure, though this is biased towards the metabolic effects, specifically brown fat activation - but most of us will take that, I think. Your 11 minutes can be done over several sessions over a 7-day period, which shows that daily exposures aren't necessary, from the perspective of metabolism and fat adaptation. If it's about a daily mental boost to help you get moving then a minimum of 11 minutes would be best over 7 daily sessions assuming you also want to pocket the metabolic benefits as well, again your intention influences how you develop your practise based on the growing science.

Mindset, mindfulness and icebaths

Everyone experiences an increase in breath (gasping, even) alongside an 80% decrease in cognitive function when getting into the ice. So how best to handle this?

Well, the main thing we're seeking is to maintain a focus, a mindfulness of what we're doing. The goal is to stay engaged whilst having those high levels of measurable stress (the catecholamines) applied to the body. Options on managing that mental state are down to where you're at on the day and whether you're doing your ice bath or cold shower. There are a few basic approaches to an ice bath, as the most intense of all methods of cold exposure:

A mindful approach using the breath

- As you enter the ice, and after the initial gasp, reduce the pace and increase the volume of breathing, slow deep breaths with longer exhales
- Double inhale and long exhale (a proven way to calm the nervous system)

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- Alternatively, relax and double inhale quickly before then making the ‘ommm’ sound, this enables the out-breath to easily be extend to 10-15 seconds (or more with practise) which further activates the nervous system for relaxation despite the cold.

Engage the brain

- Dr Huberman favours the idea of giving the mind something to do such as a maths challenge or reciting poetry. The point is to take the mind to a place that keeps it engaged.

Grind it out

- Just ‘powering through’ is absolutely possible. Whether after a round or two of active breathing (such as Wim Hof Method) or simply getting psyched up and just get in (often the best method when practicing DCE in a group). In our experience, it still falls back to using the breath at some point whether active or more relaxed.

Interoception and using ‘walls’

- Wim Hof refers to the idea of feeling your way into and through the cold. Wim says, “You are in control. You are the captain of your ship!” Here is how to start to apply that. It’s for advanced practitioners who want to develop a cold practise to last decades. We mentioned earlier the ‘walls’ as a method on Prof Huberman’s podcast (Huberman Labs). A ‘wall’ is essentially a rush of catecholamines that you can physically feel. It takes only a little practice to develop this awareness. The aim is to count the ‘walls’ on top of the breath approach mentioned above. Set the intended number of walls before you begin, 2, 3, 4, 5 walls based on how you feel today. This protocol turns cold exposure into a deep, meditative practise, that offers more flexibility over time and temperature. It makes the cold a personalised health practise for mental resilience by learning behavioural control, which translates to real life. Everyday surprises we don’t like - texts, emails, news, conversations, interactions with other people that we let affect us. Approaching ice baths using the ‘walls’ approach gives us something we can personalise into the future and build tangible resilience for real-life stressors. Of course, it’s not relevant if resilience building isn’t your goal and, for example, you use the cold as a basic recovery treatment instead.

■ Physical challenges for advanced dippers

Sometimes, people want to push themselves more physically. Again, for advanced practitioners, you can regularly challenge yourself during some of your sessions each week. There is a list of next steps below, but note the mental health, immune and physiological benefits are delivered no matter what. These are simply ways to challenge yourself further. To keep leveraging the positive stress for building greater resilience both physically and mentally, a strong mind-set (mental and emotional toughness). There is no suggestion to do it all at once!

- Lower the temperature (incrementally and safely)
- Increase the duration (incrementally and safely)
- Increase the frequency (once or twice daily)
- Submerge the hands and feet - the glabrous skin is this fastest way to cool our bodies
- Neck fully submerged - covering the vagus nerve (sides of the neck)
- Agitate by moving or gently rocking in the water
- A short head dunk: only once you're fully relaxed
- With **HUGE** caution: drive the shiver response*



ALWAYS, ALWAYS
WARM UP SLOWLY AND
NATURALLY FOR SEVERAL
MINUTES AFTERWARDS

Actively driving the shiver response

* For advanced practitioners and biohacker types only, this drives further metabolic increases, and is mentally, very challenging. This can be done by getting in and out of the cold water, then stand and air dry out for a few minutes to start the shivering. Get back in for a minute if you don't shiver. Repeat several times. It's a brutal cycle, but interesting for the die-hards who want to maximise the bang for their buck. It works because shivering (mechanical as opposed to metabolic thermogenesis through brown fat) releases succinate from the muscles which further activates brown fat thermogenesis, on top of the norepinephrine already doing the same. There is no requirement to end on the cold shiver, but if you want to increase your metabolism then play with it, safely of course, in some predefined 'challenge sessions'. It would be wise to have someone watch over you.

IMPORTANT: After your dip and warming up.

Warm up as naturally as possible to maximise the metabolic benefits. No saunas or hot tubs until after 30 minutes. Here you risk your safety and also negate all of the metabolic benefits that you just collected.

- **Slow is good.** You may feel stiff and a little slow. This is totally normal. Take it slowly. The Wim Hof Method encourages use of the simple "horse stance" (Google it) to slowly warm up which is super effective. This moves the cold and warm blood around, circling the warm blood back to the cold limbs. Walking or gentle cycling on a stationary bike will work well too. Many people just sit still and warm up with no movement at all. Again, some interceptive focus is needed here, it's mind over body.
- **Double the time that you were in the cold.** So, if you were in the water for 2 minutes, your warm-up should be 4 minutes (at least). Don't rush this, stay in the zone and complete the practise. If you skip the warm-up, you risk warming too quickly and miss out on closing the practise that readies you for next time.
- **Be conscious of how you feel.** Was the practise good? Was it cold enough or too cold? Did you stay long enough or too long? What did you notice over last time? What did you learn? What messages was your body telling you?

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- **Nothing fast.** We don't want blood moving too quickly. Just as a car engine is warmed up slowly, you need to take that approach with warming your body.
- **No weights!** We suggest not to swing weights or lift anything heavy after ice baths. Popularised by some, this is potentially dangerous and here's why: superficial muscle and nerve cooling caused by ice bath exposure can lead to impeding movement, reducing grip strength and fine motor skills. Even the sense of touch can be significantly impaired for a period of time. It's one reason why people who get into ice water can accidentally drown. As you adapt to the cold, the risks decline, but even then, swinging weights around is totally unnecessary to warm up naturally.

A caution on 'after drop'

For ice bath users only, 'after drop' can occur if your body detects a warm environment too quickly after the cold. Take 5-10 minutes to warm up wherever you got in the ice bath. After drop is caused when the body senses warmer temperatures and dilates the blood vessels too quickly. This releases the cold peripheral blood back to your heart too quickly and mixing it with warm blood creates a sudden drop in core body temperature. This can lead to a severe shivering 10-15 minutes after the cold exposure, it's dangerous, and it's not fun. Staying in the cold water too long has the same outcome. Severe shivering is triggered if the core temperature drops too low. Listen to your body. Ice water is no place to be led by the ego. Your body will tell you (through a huge wave of catecholamines) that it wants out.

■ A note on using sauna and contrast therapy

The use of sauna is encouraged as both hot and cold work on similar pathways and Nordic cultures have done this for millennia. However, the evidence for maximising the metabolic benefits suggests starting in the hot and ending in the cold, and then reheat naturally. This matters for the people wanting to increase metabolism and activate brown fat, warming in saunas or hot rooms will stop this benefit. The process of reheating naturally encourages the body to adapt, ending in saunas discourages this adaptation of our metabolism.

BIOHACKER TIPS

We're not all CEOs looking for the latest hack, but they're good to know if you have the time to play with it. Hacking your benefit in the cold through fasting and caffeine are two good places to start.



FASTED STATE

When we are in a fasted state our base levels of norepinephrine are already higher. Experience cold exposure while in this fasted state presents an interesting opportunity to further magnify the benefits of cold exposure through even higher increases of norepinephrine. Another reason for an early morning dip.



CAFFEINE

A way to further the dopamine hit is to drink Caffeine (2-3 cups of coffee). Ingested 60 -120 minutes prior to cold exposure, caffeine increases the density and efficacy of the dopamine receptors in the striatum and has the potential to increase the uptake of dopamine in the brain.

■ In summary...

So, there you have it. Our guide on progressing with CWI and ice baths.

We'd love your feedback and welcome you to share your experiences at dce@brassmonkey.co.uk. We will keep updating and improve this guide as new science emerges and as new evidence is presented. We'd love to include contributions from your personal experiences of the cold. The guide will always be free and never require any form of marketing data capture. The goal is to help people get more out of cold-water immersion.

Always remember these broad guidelines:

- You're always in control, keep it that way
- Breath is the key. Make it slow and steady with longer exhales
- This is fun, keep it that way!
- Enter cold water calmly and exit consciously (especially ice baths)
- Listen to your body when using the two levers (time and temperature)
- Time your dips so not to disrupt your circadian rhythm and sleep.
- Warm up slowly and naturally (this is the most important part!)

Part 4

REFERENCES



■ References

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6168273/>
2. <https://pubmed.ncbi.nlm.nih.gov/17051205/>
3. <https://pubmed.ncbi.nlm.nih.gov/8634703/>
4. <https://www.nature.com/articles/nature14142.epdf>
5. <https://molecularbrain.biomedcentral.com/articles/10.1186/1756-6606-3-15>
6. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3548657/>
7. Locus coeruleus neurone <https://dx.doi.org/10.1111/j.1460-9568.2008.06208.x>
8. Human response to cold immersion <https://dx.doi.org/10.1007/s004210050065>
9. The role of norepinephrine and mood disorders [https://dx.doi.org/10.1016/S0006-3223\(99\)00127-4](https://dx.doi.org/10.1016/S0006-3223(99)00127-4)
10. The role of norepinephrine and cognitive disorders [https://dx.doi.org/10.1016/S0006-3223\(99\)00232-2](https://dx.doi.org/10.1016/S0006-3223(99)00232-2)
11. Human norepinephrine deficiency <https://dx.doi.org/10.1002/ajmg.10196>
12. Norepinephrine and depression <https://dx.doi.org/10.2147/NDT.S19619>
13. Risks of norepinephrine re-uptake drugs treating depression <https://dx.doi.org/10.1007/1642018164>
14. Cryotherapy as an add-on therapy <https://dx.doi.org/10.3389/fpsyt.2020.00522>
15. Cold showers and depression (a hypothesis): <https://www.sciencedirect.com/science/article/abs/pii/S030698770700566X>
16. Open water swimming and major depressive symptoms: <https://dx.doi.org/10.1136/bcr-2018-225007>
17. Dr Huberman podcast: <https://hubermanlab.com/using-deliberate-cold-exposure-for-health-and-performance/>
18. brown fat and human obesity management <https://dx.doi.org/10.1111/nyas.12304>
19. Cold acclimation recruits BAT in obese humans <https://dx.doi.org/10.2337/db15-1372>
20. Cold acclimation improves insulin sensitivity <https://dx.doi.org/10.1038/nm.3891>
21. Impact of BAT on glucose metabolism <https://dx.doi.org/10.1038/ijo.2013.206>
22. BAT and cardio metabolic health <https://dx.doi.org/10.1038/s41591-020-1126-7>
23. Cell, Susana Soeberg - [https://www.cell.com/cell-reports-medicine/pdfExtended/S2666-3791\(21\)00266-4](https://www.cell.com/cell-reports-medicine/pdfExtended/S2666-3791(21)00266-4)

References

24. Implications for non-shivering thermogenesis: <https://pubmed.ncbi.nlm.nih.gov/21490370/>
25. Adipose plasticity: [https://www.cell.com/cell/pdf/S0092-8674\(21\)01454-9.pdf](https://www.cell.com/cell/pdf/S0092-8674(21)01454-9.pdf)
26. BAT contributes to energy expenditure during cold exposure: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3266793/>
27. Cold showering and sickness: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161749>
28. Winter (ice) swimming and health, a review: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7730683/>
29. <https://onlinelibrary.wiley.com/doi/abs/10.1046/j.1365-2281.2000.00235.x>
30. <https://www.sciencedirect.com/science/article/abs/pii/S0306987703002706?via%3Dihub>
31. <https://link.springer.com/article/10.1007/BF00242274>
32. <https://journals.physiology.org/doi/full/10.1152/jappl.1999.87.2.699>
33. Activation of NK cells <https://www.liebertpub.com/doi/10.1089/jir.1988.8.393>
34. Wim Hof, regulation of autonomic function during cold exposure: <https://pubmed.ncbi.nlm.nih.gov/29438845/>
35. Wim Hof Method: <https://www.wimhofmethod.com/practice-the-method>
36. Impact of cold water immersion compared with passive recovery - a meta analysis of 52 studies: <https://pubmed.ncbi.nlm.nih.gov/35157264/>
37. [https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964\(15\)30081-5/fulltext](https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(15)30081-5/fulltext)
38. <https://link.springer.com/article/10.1007/s00421-007-0524-6>
39. <https://meridian.allenpress.com/jat/article/47/6/664/111339/Five-Day-Whole-Body-Cryostimulation-Blood>
40. <https://link.springer.com/article/10.1007/s00421-007-0524-6>
41. [https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964\(15\)30081-5/fulltext](https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(15)30081-5/fulltext)
42. Arthritis <https://www.mdpi.com/2073-4409/9/4/880>
43. Pain and the cold <https://onlinelibrary.wiley.com/doi/10.1111/j.1399-6576.1988.tb02812.x> and <https://pubs.asahq.org/anesthesiology/article/98/1/189/40548/Comparison-of-the-Visceral-Antinociceptive-Effects>
44. Effects of cold exposure for strength training: <https://pubmed.ncbi.nlm.nih.gov/26174323/>

References

45. Changes in inflammatory response after cold exposure:
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0022748>
46. Effects of whole body cryo on experienced runners:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3233540/>
47. Cold thermo and mitochondrial biogenesis:
<https://pubmed.ncbi.nlm.nih.gov/26041108/>

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