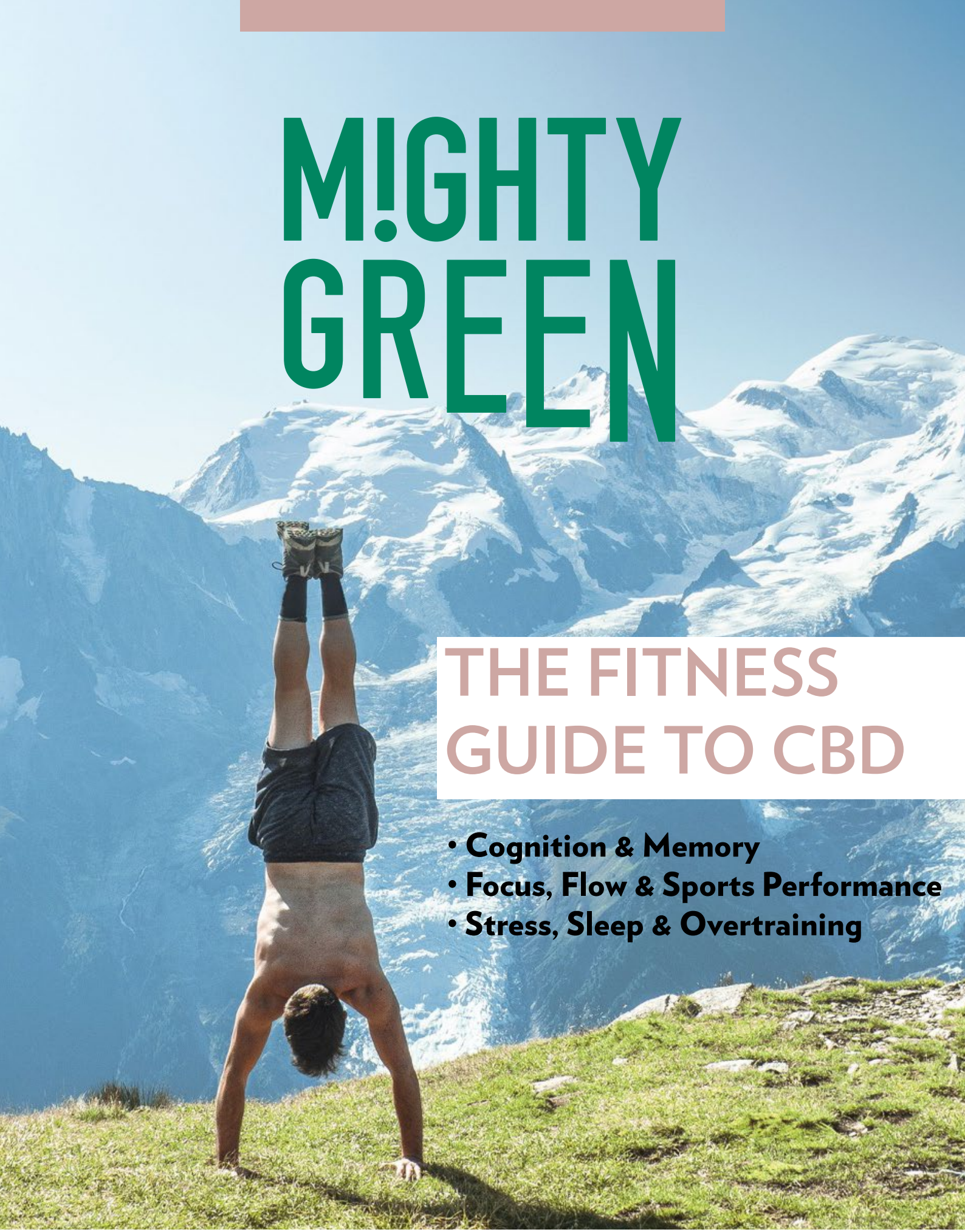
MIGHTY GREEN



THE FITNESS GUIDE TO CBD

- **Cognition & Memory**
- **Focus, Flow & Sports Performance**
- **Stress, Sleep & Overtraining**

Claudia le Feuvre, Nutritional Therapist & Eating Psychology Coach
By **Rory Batt**, BSc Exercise & Sports Science, MA Personalised Nutrition

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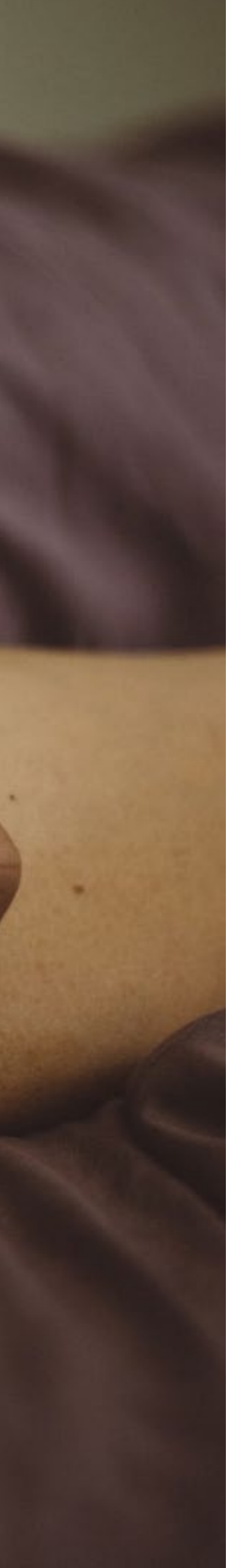
for health professionals, by health professionals

Look out for our weekly emails keeping you up to date with the very latest info, and reach out to us at support@mightygreen.co.uk with your questions. If you haven't already, register with us for special PT discounts and commissions at www.mightygreen.co.uk/pt



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Important: Because CBD is classified as a food supplement we cannot make medical claims about CBD. This magazine is to inform you as a health professional where the science and research is going.

Introduction

Thanks for downloading The PT's Guide To CBD! You're about to discover how you can supercharge your own health and fitness regimen, whilst also helping your clients reach new levels of success and health.

With the info we'll provide herein you'll be ahead of the game with CBD, so you can gain an edge in your space and take your training practice to the next level.

Loads of people are using CBD right now, but there's often confusion about what its actually good for and how you go about using it.

I bet some of your clients are even using CBD oil right now, but perhaps haven't got the best out of it yet. Our goal is to help you help them squeeze every bit of awesomeness out of CBD.

We want to give you the full downlow of how you can effectively incorporate CBD into your lifestyle, and to help you do the same for your clients. As health professionals ourselves, we are on a mission to help educate and give you confidence around CBD.

CBD is THE new thing, and people are talking. Like with any new craze, things get blown out of proportion and some people go into it with false expectations. In this book, we'll do our best to highlight the areas that CBD can help, and where there's not so much evidence.

This way, you provide your clients with information that actually works, and boost your credibility in doing so.

We'll take you on a journey all the way from what CBD is, how it works, its benefits, and how to use it most effectively.

Who the Hemp are Mighty Green?

We are a team of experts, passionate about helping people transform their health and live their best lives. Our unique combination of sports and health industry knowledge, clinical experience and technical expertise helps us innovate, source, and deliver the very finest products.

We have travelled far and wide to source the very best CBD extract with a host of other beneficial cannabinoids whilst keeping THC well below legal limits. We also filtered for purity which means our oils taste great too, especially when combined with MCT (coconut-derived) oil to enhance the assimilation of CBD.

We are health professionals and industry leaders on a mission to share our expertise with you.

Introducing...

Mike Balfour OBE, health industry pioneer, founder of Fitness First health clubs around the world and now co-founder of Mighty Green.

Claudia le Feuvre, Nutritional Therapist, Eating Psychology Coach and co-founder of Mighty Green. Claudia has 13 years of clinical nutrition experience. She first learned about CBD 2 years ago from clients seeing profound improvement in pain management conditions and was driven to find out more. Claudia has worked with an array of sports clients including professional golfers and Iron Man contestants.

Rory Batt, Nutritional Therapist, Rory has a BSc in Exercise & Sports Science, and an MSc in Personalised Nutrition. He completed his MSc dissertation on the application of cannabinoids in type 2 Diabetes. Rory has been using CBD for over 6 years, which has helped him improve his training, sleep, mood and quality of life in general. This sparked an insatiable interest into how something could help improve his life in so many ways. He now studies the application of cannabinoids in other health conditions, and has joined Mighty Green to help educate on cannabinoids and CBD for improving health.

What is CBD?

You've probably heard about CBD or even seen it in coffee shops, health food stores, spa's and even your local gym - but what the heck is it? There's a lot of magic locked in this mighty molecule.

CBD is actually short for cannabidiol, and it's one of many special chemicals that naturally occur within Cannabis Sativa plants, which are a special variety of hemp.

The magic molecules in Cannabis Sativa are called cannabinoids, which each have their own special powers. The amazing thing is, you can find over 100 cannabinoids in hemp. It just so happens that CBD is one that's particularly special.

Unlike its psychoactive sibling THC, **CBD does not get you high**.

CBD doesn't take you on a wild and unsuspecting ride. That means you don't feel altered, euphoric or out of control in any way whatsoever.

Instead, the feeling you get from CBD is like receiving a hug from a friend, or that feeling when you step into a nice warm bath. It's a little bit of nice, without the stuff you don't want (and neither does law enforcement).

Think of someone who enjoys drinking coffee, but doesn't like caffeine – so they drink de-caf. Coffee is still chock full of great stuff like antioxidants which are healthy and can make you feel good. It's the same with CBD. **CBD is basically the de-caf version**. Or de-THC if you like.

“helps maintain equilibrium in the body”

How CBD works

Get this, you have a system in your body which actually runs on its own cannabinoids! They run around the body helping keep it healthy and balanced.

CBD taps into this system and helps maintain equilibrium in the body.

You know what this system is called?

The Endocannabinoid system (ECS)

The ECS is a communication system that uses its own naturally occurring cannabinoids to continuously deliver messages throughout the body.

These messages allow the ECS to continuously keep the body balanced and in sync, so that it can be flexible and adaptive in response to the outside world.

This is the essence of homeostasis - the process by which the bodies internal environment is kept in consistent equilibrium, despite constant changes in the world outside.

The ECS coordinates the body much like a conductor leads an orchestra to play in synchronous harmony. If one instrument (organ/system) starts to play out of tune, the ECS syncs it back up with the rest.

Keeping a balanced body ensures we remain fit and experience vibrant, lasting health and vitality.

The ECS delivers messages using its own cannabinoids. They're called endocannabinoids because they are naturally made inside each and every one of us.

The two main endocannabinoids are called:

1. Anandamide (AEA for short)
2. 2-Arachidonoylglycerol (2-AG for short)

Incredibly, endocannabinoids are super similar to phyto-cannabinoids (like CBD), which are found in hemp.

What this means is that phyto-cannabinoids can do many of the same jobs as endocannabinoids in the body. So because your body already runs on cannabinoids, you can use external sources of cannabinoids to help support its function.

Sometimes the ECS can struggle to maintain balance on its own, which can lead to poor health. So using phytocannabinoids can help the ECS support health and equilibrium in the body.

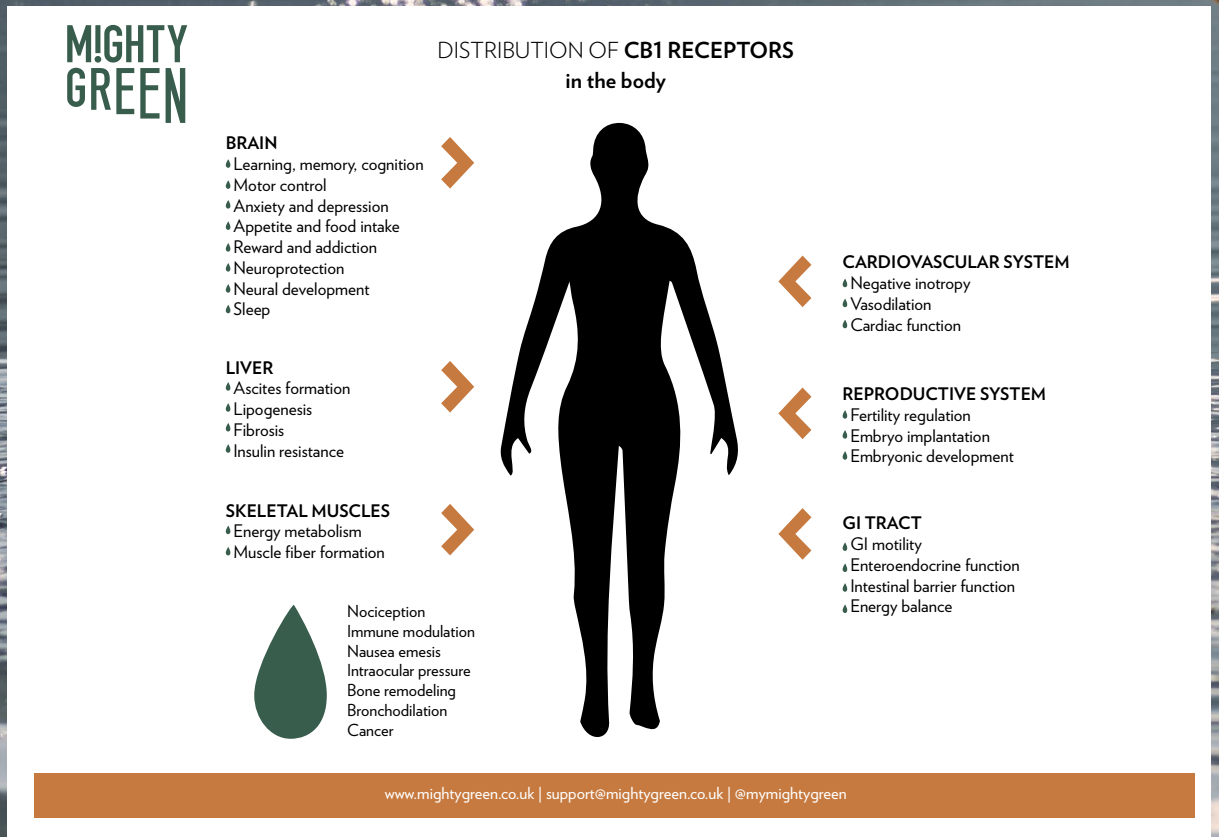
Now we're just going to briefly cover how the ECS works, so you can understand how CBD works.

You now know that the ECS uses its own cannabinoids to deliver messages throughout the body. Now I'm going to tell you how these messages are received, and how they translate into biological changes in the body.

The ECS uses special receptors to receive messages. These receptors specifically recognise endocannabinoids and phytocannabinoids, and are aptly named cannabinoid receptors.

There are two main cannabinoid receptors:

- Cannabinoid Receptor 1 (CB1)
- Cannabinoid receptor 2 (CB2)



CB1 is found mostly in the brain and nervous system, but also in the:

- Liver
- Fat tissue
- Pancreas
- Muscle
- Gastrointestinal system
- Lungs
- Reproductive organs

CB2 is mainly found in immune system, but also in:

- The central and peripheral nervous system
- Bone making/degrading cells
- Skin nerves
- Skin cells
- Liver
- Pancreas

Endocannabinoids and cannabinoids 'bind' with cannabinoid receptors in much the same way a key fits into a lock.

When a cannabinoid receptor is locked or unlocked by a key, it triggers diverse biological changes across the body, including:

- Appetite
- Sleep
- Mood & Emotion
- Memory
- Cognition
- Energy metabolism
- Thermoregulation
- Digestion
- PH Balance
- Blood Pressure
- Pleasure & Reward
- Pain
- Reproduction
- Inflammation
- Immune function
- Respiration

This is how phyto-cannabinoids from hemp can do many of the same jobs as the endocannabinoids in the body, and act as powerful regulators of human health.

The Endocannabinoid System & Exercise

Fasten your seatbelts people, it's about to get interesting. Remember what we were saying about the ECS keeping us flexible and adaptive to changing demands?

Get this - it's actually the ECS that allows us to meet the demands of our training, workouts and competition.

For example, when you start running the ECS does a few things:

1. It ensures blood vessels dilate (Margarita Martín Giménez et al., 2018), so exercising muscles get the nutrients they need to produce energy and perform work.
2. It regulates breathing rate (Iring et al., 2017), to provide oxygen rich blood to muscles to help them produce energy from nutrients.
3. It helps boost metabolism by revving up mitochondria to turn over energy quicker (Mendizabal-Zubiaga et al., 2016).
4. It maintains core body temperature (Wenger, Moldrich., 2002), so you don't overheat from the heat that is produced from exercise.

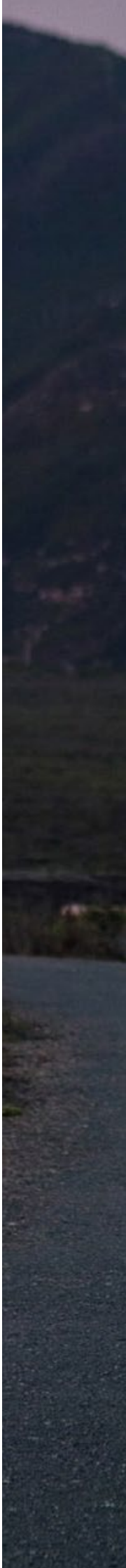
These are all important factors in initiating and sustaining exercise, and the ECS adjusts them to meet the increased physiological demands of exercise.

So what happens is that the ECS actually becomes 'activated' when you start exercising. Its activity increases to help us adapt to the work that's in front of us, whether that's lifting weights, a heavy HIIT session or a killer cardio workout.

When the ECS is activated by exercise, it has lasting benefits in the body after you've finished your workout.

Research has found that exercise increases the levels of our bodies own natural endocannabinoids:

Anandamide increased after moderate intensity cycling and running (Sparling et al.,2003). Levels of Anandamide increased after strenuous hiking (Feuerecker et al., 2012). Endocannabinoids increased after moderate intensity running (Raichlen et al., 2013). Anandamide was increased during and after intense cycling (Heyman et al., 2012).



When our bodies are 'boosted' by endocannabinoids after exercise, this can increase aspects of our health & wellbeing

This is part of the reason exercise is so ubiquitously good for us, because it's the ECS that's the middle man in producing the well known benefits of exercise:

Cognition & Memory

Exercise is well known to improve brain plasticity and cognition by increasing cell growth in the hippocampus - the process known as neurogenesis. The ECS regulates neurogenesis via the CB1 receptor.

Anandamide is able to increase neurogenesis via activating the CB1 receptor (Tantimonaco et al., 2014). The hippocampus is also responsible for forming memories, which may be positively affected by the ECS after exercise (Loprinzi et al., 2019).

Stress & Mood

Exercise induces a state of consciousness known as the runners high. The runner's high has been described as pure happiness, elation, a feeling of unity with one's self and/or nature, endless peacefulness, inner harmony, boundless energy, and a reduction in pain sensation (Dietrich, McDaniel., 2004).

Incredibly, when we perform exercise (particularly endurance) we stimulate the production of Anandamide in the brain. Anandmide has been shown to improve mood and reduce stress by activating CB1 in specific brain regions - the hippocampus, Amygdala and Paraventricular nucleus (Tantimonaco et al., 2014). This is how Anandamide got its name, from the sanskrit word Ananda which translates to 'bliss'. The runners high has been largely attributed to Anandamide.

Interestingly, similar observations are made by people who describe their experiences with cannabis/THC. They report feelings of distorted perception, atypical thought patterns,

diminished awareness of one's surroundings, and intensified introspective understanding of one's sense of identity and emotional status (Dietrich, McDaniel., 2004).

THC produces these euphoric effects through activating the CB1 receptor in the brain. This is how one may experience an 'altered state' with cannabis. So there's an incredible biological similarly from the high we experience from exercise, and that of cannabis.

Metabolism

Exercise improves insulin sensitivity and metabolic flexibility in muscles, reduces the accumulation of fat in the liver and stimulates the use of fat from bodily stores (Tantimonaco et al., 2014).

As you'll discover later on, the ECS is involved in all these processes. It plays a leading role in regulating metabolism, but tends to encourage the storage of fat and discourage the utilisation of energy. However, during exercise the opposite seems to be true. Researchers are still trying to figure out how the ECS responds to exercise.

Pain Reduction

Anandamide can have widespread pain reducing effects in the body. Again, Anandamide increases during and following exercise, which increases activation of the CB1 receptor in the spinal cord to reduce pain (Dietrich, McDaniel., 2004).

Immune System

Different types, duration and intensities of exercise can help promote a healthy immune system.

In general, exercise suppresses the immune system by reducing levels of inflammation, decreasing the number of activated immune cells and increasing the number of immune cells that prevent against excessive immune responses.

The ECS actually bridges the gap between exercise and its effects on the immune system. Cannabinoid receptors are found on immune cells, so when we exercise we are increasing the activation of CB2 in particular.

The endocannabinoid Anandamide activates CB2 on immune cells, which reduces the pro-inflammatory response and triggers an anti-inflammatory response (Tantimonaco et al., 2014).

This is how exercise in general helps to keep levels of inflammation in check. However chronic, heavy and intense exercise is well known to produce inflammation. It's possible the ECS fails to arrest inflammation under these conditions, which is why using CBD could possibly lend a hand.

SKELETAL MUSCLE
↑ • Glucose Uptake ↓↑
↑ • Insulin Sensitivity ↓↑

ADIPOSE TISSUE
↓ • Glucose Uptake ↑
↑ • Lipolysis ↓
↓ • Lipogenesis ↑

LIVER
↑ • Lipolysis ↓
↓ • Lipogenesis ↑

IMMUNE SYSTEM
↑↓ • Pro-inflammatory cytokine release ↓
↑↓ • Anti-inflammatory cytokine release ↑
↑↓ • Leukocyte proliferation & activity ↓
↑ • ROS + RNS ↑

The ECS, CBD & Cannabinoids

Cannabinoids are so scarily similar to endocannabinoids, they're basically siblings. They are keys that fit the same locks, and can perform some of the roles that endocannabinoids can in the body; ensuring balance across the bodily systems.

This may have something to do with the tidal wave of interest in phyto-cannabinoids such as CBD. People are using it for all sorts of ailments, from pain to anxiety.

CBD actually prevents the breakdown of one of our endocannabinoids, known as Anandamide (Leweke et al., 2012). CBD increases the body's natural levels of Anandamide just like exercise does.

This means there's more Anandamide available for our cells to soak up. More Anandamide provides mood boosting, anti-inflammatory and pain relieving effects (Huang et al., 2016).

CBD can also block cannabinoid receptors CB1 and CB2, which alters how messages are received by endocannabinoids (Chung et al., 2019).

So, CBD can both turn up and turn down the ECS, based on each individuals need to turn their ECS up or down.

It might be that cannabinoids like CBD could help support the function of an ECS that is struggling to maintain homeostasis in certain medical conditions.

It makes sense if you look at what roles the ECS has, and the fact that cannabinoids push many of the same buttons that endocannabinoids do.

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CBD & Focus, Flow & Sports Performance

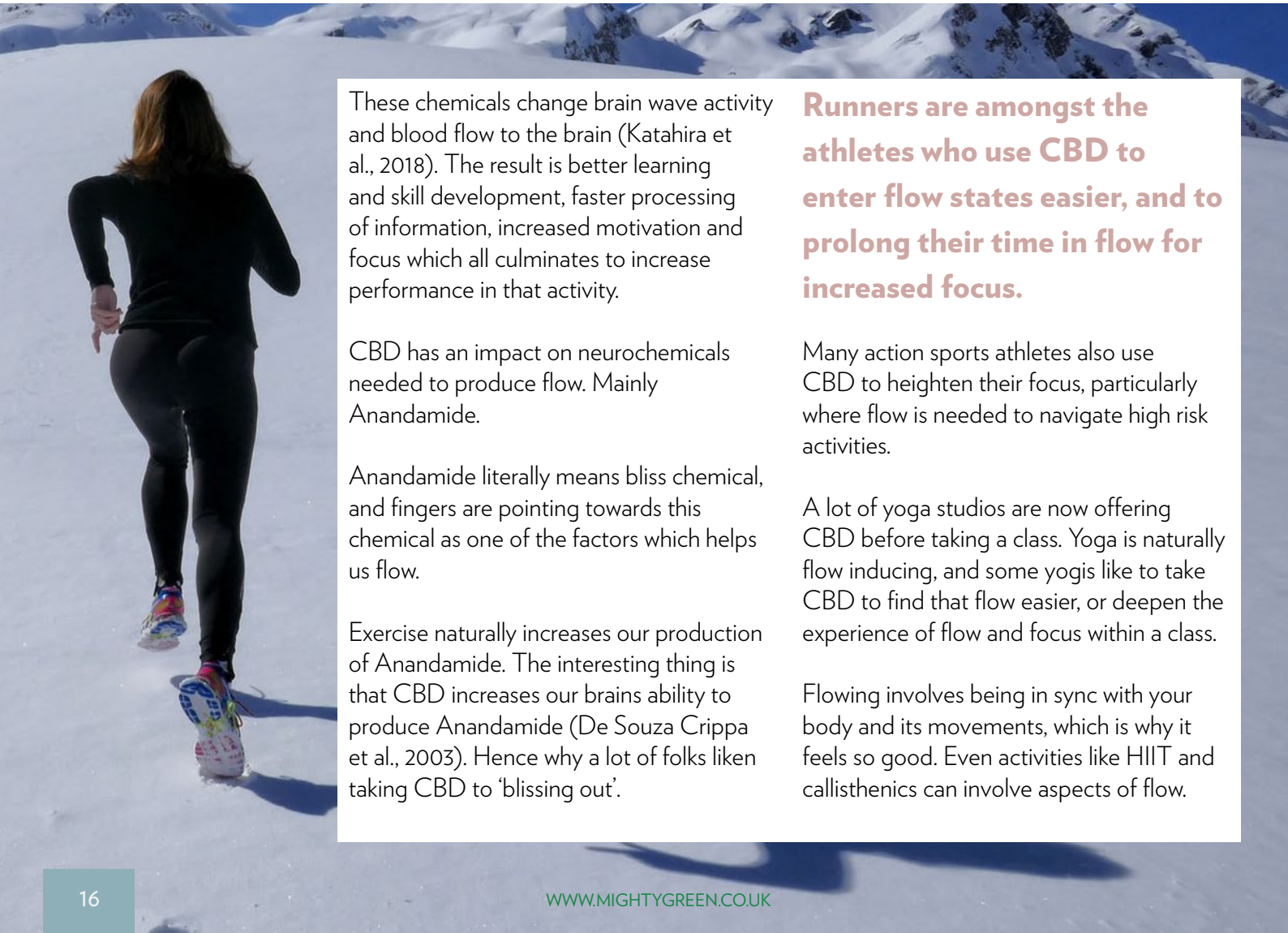
Whilst the science is still catching up to what CBD can do specifically in the context of sports performance we've collated the latest research and show you the direction research is going...

If you're an athlete or fitness fanatic, then I'll bet you've been in the zone before. That state of total immersion in your discipline, where nothing else matters. Time stands still, that voice that says 'you can't' drops away, your focus sharpens. You're flowing.

This 'flow state' is where one can effortlessly and fluidly take on the task at hand, and it's what enables a lot of athletes to perform at their very best and achieve a state of peak performance.

In running, this is specifically known as the runners high (Dietrich, McDaniel., 2004), where pace, rhythm, breathing and cadence all seem to synchronise seamlessly to allow a runner to stride as if they're floating.

What's interesting about flow states and the runners high is what's behind their occurrence. Research has found that when an athlete enters the zone, a cascade of chemical changes occurs within the brain that drives peak performance (Cheron et al., 2016). These chemicals are dopamine, noradrenaline, endorphins, anandamide, and serotonin.



These chemicals change brain wave activity and blood flow to the brain (Katahira et al., 2018). The result is better learning and skill development, faster processing of information, increased motivation and focus which all culminates to increase performance in that activity.

CBD has an impact on neurochemicals needed to produce flow. Mainly Anandamide.

Anandamide literally means bliss chemical, and fingers are pointing towards this chemical as one of the factors which helps us flow.

Exercise naturally increases our production of Anandamide. The interesting thing is that CBD increases our brains ability to produce Anandamide (De Souza Crippa et al., 2003). Hence why a lot of folks liken taking CBD to 'blissing out'.

Runners are amongst the athletes who use CBD to enter flow states easier, and to prolong their time in flow for increased focus.

Many action sports athletes also use CBD to heighten their focus, particularly where flow is needed to navigate high risk activities.

A lot of yoga studios are now offering CBD before taking a class. Yoga is naturally flow inducing, and some yogis like to take CBD to find that flow easier, or deepen the experience of flow and focus within a class.

Flowing involves being in sync with your body and its movements, which is why it feels so good. Even activities like HIIT and callisthenics can involve aspects of flow.

I can certainly attest to feeling more in tune with my body, my form and my flow when I use CBD in strength and coordination training.

Sometimes flow can be elusive, and a training session can be a drag without it. By using CBD you can effectively 'flow hack' and make it easier to find your flow.

Whilst we still share stories with each other about what CBD might do, research is being conducted by the University of California (UCLA) investigating the effect of CBD on the amount of time it takes to drop into flow, and the depth of flow experienced (Flowresearchcollective.com, 2019).

"I play a sport where taking a single point off can be the difference between winning and losing a match and Defy (CBD) is a product specifically intended to put me in a position to perform on every single point" John Isner

CBD & Muscle Soreness, Recovery & Spasms

If you're a trainer, an athlete or just someone who likes to stay fit and healthy, then you'll know all about the aches and pains that come with regular and particularly challenging exercise.

Whether its yoga, crossfit, callisthenics or rock climbing; there's bound to be some form of soreness after you've exerted yourself.

These activities all involve some degree of repeated muscular contraction, which can make muscles sore.

With resistance training in particular comes the dreaded delayed onset of muscular soreness (DOMS) that occurs afterwards.

Although no studies have looked at the direct link between CBD and DOMS, many athletes swear by it to reduce soreness and boost recovery.

DOMS is a form of exercise induced muscle damage. Its caused by micro-tears that occur in muscle fibres, particularly after eccentric muscular contractions. These micro-tears disrupt the balance of calcium in the muscles, which causes inflammation and soreness.

What might be going on here, and how may CBD help? Let's take a look under the hood at the mechanisms to find out.

CBD was found to restore calcium concentrations in muscle cells whilst also reducing inflammation (Iannotti et al., 2019). CBD is known to activate channels (TRPV1) which control the flow of calcium into cells (Ali et al., 2015). This could be one way CBD contributes to reduced soreness following training.

The same study also found that by regulating calcium flow, CBD was able to encourage the formation of new muscle fibres from stem cells (satellites and myoblasts) (Iannotti et al., 2019). This could be one mechanism by which CBD promotes the speedy recovery of muscle tissue after training.

A clinical trial has recently found that topical CBD was effective at reducing myofascial pain in patients with muscular disorders (Nitecka-Buchta et al., 2019). This finding is encouraging, and hints at a benefit for exercise induced muscular pain as well.

We've received amazing feedback about our Mighty Green CBD and Magnesium muscle balm. Magnesium naturally helps muscular relaxation and combined with CBD greatly enhances muscle recovery.

Inflammation is also something we want to be cognizant of when trying to reduce soreness and speed recovery.

Its often a controversy because inflammation is important for the remodelling and repair of muscle tissue. Inflammatory messengers IL-10, TGF-β, TNF-α, and NF-κB also encourage satellite cells to grow into new muscle fibres (Ludovic et al., 2007), leading to the recovery of muscles.

However, after training only specific areas of muscle are damaged, but the inflammatory response often spreads to areas of the muscle which haven't been significantly damaged. This is how inflammation, whilst partly beneficial for recovery can also inhibit it.

This is why athletes choose to use ice baths, and anti-inflammatory drugs following their training - to minimise the widespread effects of inflammation.

This is where CBD comes in. Whilst CBD does reduce inflammation, it may do it in a way that complements the recovery process. CBD has been found to reduce inflammatory messengers such as IL-1β, IL-6, NF-κB and TNF-α whilst having no effect on IL-10, TGF-β (Nagarkatti et al., 2009). IL-10 in particular promotes the formation of new muscle cells (Deng et al., 2012). This may be why CBD is able to reduce inflammation without inhibiting the recovery process.

A lot of oxidative damage also happens after exercise induced muscle damage, which is another factor which contributes to soreness (Jamurtas., 2018).

CBD acts as a powerful antioxidant, and when I say powerful I mean powerful - one study found it was more potent of an antioxidant than both Vitamin C and E (Hampson et al., 1998).

This is another mechanism whereby CBD helps reduce muscle soreness after exercise training.

CBD & Replenishing Energy Stores

Exercise is a metabolically expensive process and uses up nutrients in order to make energy. In the recovery period, muscles still lack strength and may still be sore. If you still have to perform quickly, then you'll want to optimise your recovery.

Another way CBD may boost the recovery process is by facilitating the delivery of nutrients back into muscles following exercise. After you've knocked back a couple of protein shakes, and maybe a few carbohydrates, those amino acids and sugars need to make it into the muscle to begin repair.

One way CBD facilitates this process is by acting as a vasodilator (Jadoon et al., 2017), widening the blood vessels to increase the flow of oxygen and nutrient rich blood to fatigued muscles.

Reducing inflammatory messengers is also important for replenishing muscle stores of glucose after exercise. IL-1β and IL-6 in particular dampen insulin signalling (Luca, Olefsky., 2009), which makes muscles less efficient at taking up glucose, and rebuilding muscle tissue (Van Hall 2012).

As an anti-inflammatory, theoretically CBD may help preserve the muscle's ability to restore, although this needs to be clarified by clinical trials.

CBD & Muscle Spasms

Theoretically the vasodilatory effect of CBD may also prove beneficial for clearing lactic acid from muscles. Pooling of lactic acid can lead to muscle spasms, pain and discomfort after training.

This hasn't been studied, but is just some food for thought.

Tension and spasms are a common problem, and often come with their fair share of pain and discomfort, not to mention interfering with rest and recovery.

Many athletes often turn to prescription drugs (benzodiazepines) to alleviate muscular tension and spasms. However, these also interfere with REM sleep which will affect recovery in the long run. They also have some nasty side effects.

Benzodiazepines work by activating GABA receptors to induce muscular relaxation. CBD works in a very similar fashion - it increases the sensitivity of the GABA receptor (Pretzsch et al., 2019), enhancing the signal to relax muscles.

In a clinical trial, CBD was shown to have significant myorelaxant (muscle relaxing) effects, which is in line with anecdotes of athletes using it for these purposes (Nitecka-Buchta et al., 2019).

MMA finger Nate Diaz recently spoke about CBD, **"It's CBD. It helps with the healing process and inflammation, stuff like that. So you want to get these for before and after the fights, training. It'll make your life a better place."**

“CBD’s… impact on pain is ubiquitous”

CBD & Pain

One of the most common uses for CBD is undoubtedly pain. There's a good body of emerging evidence suggesting that CBD may be useful for all kinds of pain.

CBD is an incredible plant compound, because it can have many different effects in the body all at one time - its impact on pain is ubiquitous. Mechanistically speaking, CBD pushes a lot of buttons that help reduce pain.

- CBD increases Anandamide, which is anti-inflammatory and analgesic upon activation of the CB1 receptor within the nervous system (Huang et al., 2016)
- CBD turns down the volume at mu (μ) and delta (δ) opioid receptors to reduce pain signalling (Kathmann et al., 2006)
- CBD turns down the volume at Glycine receptors to reduce pain signalling (Xiong et al., 2012)
- CBD increases the signalling at GABA receptors to overcome the sensation of pain (Bakas., et al 2017)
- CBD activates TRPV1 and TRPA1 receptors to reduce pain signalling (Muller et al., 2018)
- CBD promotes adenosine A2A signalling which may reduce pain (Pandolfo et al., 2011)

Clinical trials with CBD have also found it to be effective for managing pain. CBD sprays (2.5mg per actuation) have been shown to significantly reduce neuropathic pain compared to placebo (Wade et al., 2002), (Notcutt et al., 2004). A survey also found that pain was amongst the most common use for CBD (Corroon, Phillips., 2018), so it's good to see real world data supporting the (sparse) evidence for CBD's effect on pain.

Whilst it's tempting to say that this evidence translates into a training session with less pain, this still needs to be confirmed by trials with athletes.

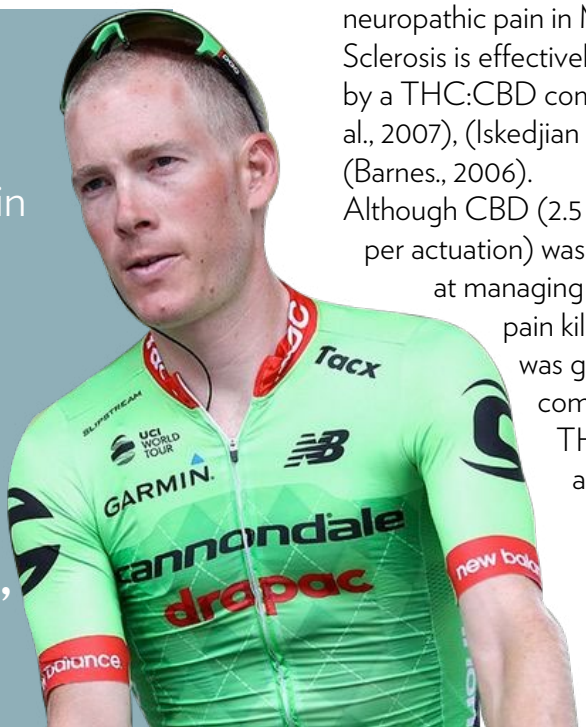
However, some athletes certainly attest to its benefits. A lot of athletes (in the States) also have access to THC, and they often choose to microdose THC alongside CBD (10:1 CBD:THC) for a more pronounced pain killing effect.

There's some decent evidence that supports the use of a 1:1 ratio of CBD:THC for managing pain.

Most studies investigating effects on pain use Sativex, a pharmaceutical THC:CBD spray (delivers 2.7 mg THC and 2.5 mg CBD per actuation). These trials have shown that neuropathic pain in Multiple Sclerosis is effectively reduced by a THC:CBD combo (Rog et al., 2007), (Iskedjian et al., 2007), (Barnes., 2006). Although CBD (2.5 mg CBD per actuation) was effective at managing pain, the pain killing effect was greater when combined with THC (Notcutt et al., 2004).

Triathlete, Andrew Talansky recently told Outside Magazine how CBD has helped him manage lingering pain from a previous hip injury.

"I took it for a couple of weeks, and there was a noticeable difference immediately. And it wasn't just that my hip was feeling better. I was less anxious, and I was sleeping better."



Note: Mighty Green's CBD products keep THC levels well below the legal limit.

How To Use CBD for Pain

There are two main ways CBD can be helpful here, which may depend on what your sport or activity is.

1. CBD can be used during training or competition to help increase tolerance to pain.
2. It can also be used to help manage pain outside of training.

Using CBD During Training

Increasing your pain threshold to tolerate particularly intense and/or long bouts of exercise no doubt helps you go the extra mile (quite literally).

Some athletes (particularly endurance) use NSAID's like Ibuprofen prophylactically to manage pain whilst competing. Interestingly, Ibuprofen doesn't appear to significantly reduce the perception of pain throughout competition (De Silva et al., 2015) - even though many athletes use it for this purpose.

A few endurance athletes are ditching the ibuprofen for CBD (sometimes with a touch of THC) help them increase their pain tolerance and focus during exercise.

"I talked to a lot of athletes, especially in like Colorado for example, who are using THC, and THC edibles, and weed to increase focus and to decrease perceptions of pain during exercise. So I decided to see if I could use CBD. I was experimenting with everything from the 10 to the 50 milligram range of CBD capsules for this, and I've found that I can get a very, very similar effect" Ben Greenfield

Whether you're taking on a particularly tough WAD (workout of the day), slogging through an ultra

or turning up the intensity, CBD may just be the thing that helps take the edge off.

Using CBD After Training

CBD is arguably the most popular choice amongst athletes who compete in sports that are hard on the body - NFL, NHL, MMA, UFC, Rugby, action sports and endurance events. These sports often come with either an acutely or chronically high risk for encountering pain, and many athletes often reach for the medicine cabinet to find relief.

There's a lot of inflammation that occurs with exercise, and it often hits the muscles and joints the hardest. Inflammation is essential for recovery and adaptation to exercise, but it's also a by product of pushing your limits, and comes at a cost - it's painful. That's why the use of NSAID's is popular in sport, particularly Ibuprofen.

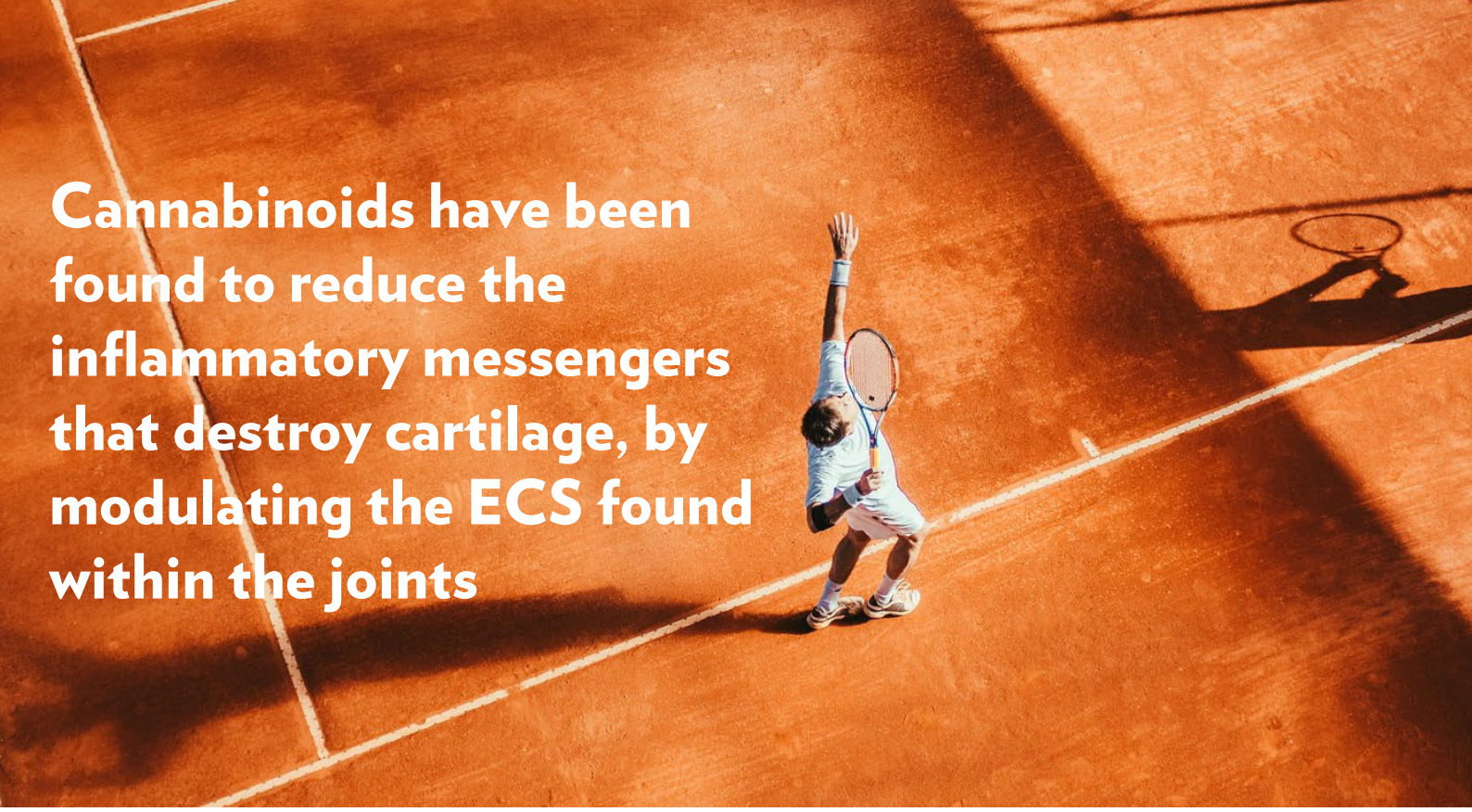
Interestingly, high doses of Ibuprofen have actually been associated with slowed muscle recovery, reduced strength and hypertrophy after resistance training (Lilja et al., 2018), which could be interfering with the acute inflammatory response to exercise. Normal doses don't appear to impact muscle pain, soreness or recovery (Krentz et al., 2008). It's tricky as high doses may be needed for pain relief, but at a burden to the recovery process.

Other downsides of long term use of NSAID's include gastrointestinal, hepatic, cardiovascular, musculoskeletal and kidney complications (Warden., 2010).

The good news folks, is that CBD is also a powerful anti-inflammatory, which has demonstrated its ability to reduce inflammatory pain and neuropathic pain (Xiong et al., 2012). It also has a great side effect profile (Iffland, Grotenhermen., 2017), which means that side effects are minimal when using it even at high doses and for long periods of time.

A few studies have demonstrated that CBD is safe to use at high doses (1,500mg) (Zuardi et al., 1995) and long term (6 months) (Cunha et al., 1980). We'll talk about dosing later. The World Health Organisation has also declared that CBD is safe (Who.int, 2019), which may translate into long term use without the risks associated with NSAID's.

Landis told the Washington Post - **"It's not something I was exposed to as an athlete, but it was effective in allowing me to wean off opioids," he says. "Now I use CBD daily as a pain reliever."**



Cannabinoids have been found to reduce the inflammatory messengers that destroy cartilage, by modulating the ECS found within the joints

CBD & Joint Health

There's no doubt that exercise takes its toll on the joints. The constant friction endured by long distance runners, the load taken by weightlifters, and the stress of dynamic and abrupt movements in sports like tennis, soccer and basketball.

A significant source of pain fitness enthusiasts and athletes experience is from wear and tear on the joints.

For example, a recent meta-analysis found that long exposure to high-volume and/or high-intensity running is associated with hip and/or knee osteoarthritis (Alentorn-Geli et al., 2017).

A systematic review of different sporting disciplines revealed that elite level soccer players, weight lifters, wrestlers and American football players (elite and amateur) had a higher prevalence of osteoarthritis in their knees (Driban et al., 2017).

Elite track and field, hockey and handball players have a higher risk of developing hip osteoarthritis (Vigdorchik et al., 2017). Osteoarthritis is the most common form of arthritis, which results in a breakdown of the joints protective cushioning - the cartilage.

Osteoarthritis is only partly underpinned by inflammation and may also be driven by mechanical wear and tear, causing structural damage to the cartilage. There's no evidence (yet) that cannabinoids like CBD can help with the structural component of osteoarthritis, but may for the inflammatory component.

In osteoarthritis, inflammation occurs in the joints which affects various tissues that are crucial to their function; the cartilage, synovial membrane (synovium) and bone.

Cannabinoids have been found to reduce the inflammatory messengers that destroy cartilage, by modulating the ECS found within the joints (La Porta et al., 2014). The ECS regulates the metabolism of cartilage tissue, so using

cannabinoids is a way to potentially influence cartilage turnover.
That's not all - the ECS is also found in the synovium, the soft tissue which lines the entire inner space within a joint, except where its lined with cartilage. Again, it's the ECS' job to maintain the turnover of these tissues so that the synovium remains strong and protective to joints.
Cannabinoids have also been found to inhibit the inflammatory messengers which seek to destroy synovial tissue (La Porta et al., 2014), which may help preserve overall joint health.

The ECS also controls bone metabolism - the essential balance between the synthesis and breakdown of bone tissue. CBD has actually been found to reduce the breakdown of bone (minerals) in mice (Whyte et al., 2009).

CBD is able to reduce pain, inflammation and swelling associated with general arthritis in rats (Hammell et al., 2016). CBD has also been found to reduce Osteoarthritis pain (Philpott et al., 2017). Similar cannabinoids have also been found to reduce weight bearing deficits and improve grip strength in rats (O'Brien, McDougall., 2018), suggesting improved joint function.

There's no clinical evidence in humans that CBD may slow the progression of osteoarthritis. But the mechanisms suggest cannabinoids may prevent the early stages and progression of osteoarthritis by inhibiting the breakdown of tissues essential for proper joint function.

For now, we may have to rely on anecdotes from athletes as more and more adopt CBD into their training and recovery regimens.

"I've been on CBD for well over a year now, and I can tell you that my body feels great. I have no more inflammation in my body, my knee, and my joint pain is gone. My migraines — I haven't taken migraine medicine for over a year" Terrell Davis

Tendonitis is also a common problem for athletes across the board. One example being tennis elbow.

Tendons transmit the forces of muscle to the skeleton, and are subjected to repeated mechanical loads. Heavy training and competition may ramp up tendon tissue deterioration, and inflammation.

Tissue deterioration and inflammation both play a role in tendinopathies. As a powerful anti-inflammatory, I would expect CBD to be useful for the inflammation, but perhaps not the tissue deterioration. That's just a thought - there's currently no scientific evidence to support it.

However, Charles Bush-Joseph, M.D has this to say; **"CBD coupled with stretching, icing, and foam rolling is a common treatment plan for tendonitis injuries about the knee, such as iliotibial band syndrome."**

CBD & Bone Health & Injury

"I wanted to focus on recovering from my torn MCL so I tried the CBD oil. I healed my knee faster than my docs had ever seen. I'll never forget the Dr. saying "I've never seen anyone recover from an injury this quickly." After everything I had heard about CBD, it wasn't a shock and I was a believer." Chris Camozzi

Almost every athlete has encountered an injury throughout their career. Some injuries are manageable, and may only put you out a few weeks, depending on your sport. The kind of injuries that can put you out a season or more are broken bones. Particularly susceptible to fractures are athletes who compete in contact and action sports.

I've already mentioned that the ECS controls the creation and destruction of bone (Bab et al., 2009), (Ehrenkranz, Levine., 2019), so it may come as no surprise that cannabinoids may have an effect on fractures and bone regeneration/density (Apostu et al., 2019).
Bone density is a balance between producing bone and breaking it down. When cells that break bone down (osteoclasts) are suppressed, it allows bone producing cells (osteoblasts) to run the show, encouraging increased bone density.
CBD affects bone metabolism by increasing the number and function of bone producing cells, and by reducing the activity of bone degrading cells and the resorption of bone in mice (Whyte et al., 2009).

There are receptors on bone forming and bone degrading cells. CBD either directly or indirectly interacts with these receptors:

- Blocks GRP55 on bone degrading cells, which reduces their activity and helps preserve bone density (Whyte et al., 2009)
- Blocks CB1 activation on bone degrading cells, reduces osteoclast number and bone resorption (Idris 2010)
- Blocks CB2 activation on bone cells (Idris 2010)

CBD has actually been found to enhance fracture healing in rats with broken legs (Kogan et al., 2015), which supports the mechanisms above.

George Kruis used CBD whilst he was recovering from an ankle injury;
"I spray it under the tongue for a minute or two and then just go about my business."

It has also been found that CBD reduces bone loss in rats with a spinal cord injury, by preserving bone volume (Li et al., 2017).
It'll be interesting to see how CBD fares in clinical trials investigating fracture healing, but the studies in animals are really interesting so far. As we've discussed earlier, the anti-inflammatory, antioxidant and tissue regenerating properties of CBD may help boost recovery. Some athletes

also state that CBD has helped them recover from injury.

CBD & Stress, Sleep & Overtraining

Sport and exercise is demanding on the body. It's a stressor that serves to initiate adaptations that will better serve us against it in the future.

However the balance between a beneficial stressor and a deleterious one is a fine line for athletes and fitness enthusiasts. You want to ensure you do enough to get faster, stronger and more resilient, but this comes at the risk of overtraining.

To optimise the balance between getting the beneficial adaptations from stress, and minimising the downsides, one must control other stressors in their life.

Sleep is one of the most important recovery processes, and there's no compromise on losing out on it. Poor sleep or sleep deprivation is a stressor, and one you could do without.

When we don't get enough sleep, our hormonal equilibrium suffers as a result. I'm mainly referring to cortisol, which becomes elevated with chronically bad sleep. Elevated cortisol is a sign of overtraining, and can have negative effects on your performance.

Similarly financial, emotional, romantic and mental stress all pitch in to raise cortisol. Lifestyle stress is a negative synergy with exercise, because it too can ramp up cortisol production.

One study in middle and long distance runners found that starting the season with elevated cortisol values significantly reduced performance during the season (Balsalobre-Fernández et al., 2014).

Cortisol production depends on the type, intensity, volume and frequency of exercise. High intensity resistance exercise (60-80% Vo2 Max) elicits a greater cortisol response than lower intensity (40% Vo2 Max), which actually reduces cortisol (Hill et al., 2008).
HIIT is associated with higher cortisol than aerobic endurance exercise 12 hours after training (Cofré-Bolados et al. 2019). If rest periods are shorter and exertion is higher in resistance training this tends to increase cortisol levels (Rahimi et al., 2011).

Chronic high volume training and higher rates of exertion unsurprisingly correlate with increased cortisol in distance runners (Balsalobre-Fernández et al., 2014).

The art of sustainable training is therefore to offset high intensities with lower volumes and adequate rest, and to offset high volume training with lower intensity. Higher training frequency also jacks up cortisol levels, so also needs considering. Measure your Heart Rate Variability (HRV) to stay on top of your stress levels.

Elevated Cortisol is a problem for a few reasons:

- Cortisol is catabolic and breaks down muscle tissue (Gore et al., 1993).
- Cortisol is important for regulating inflammation, chronic elevations reduce immunity (Hannibal, Bishop 2014).
- Cortisol is antagonistic to insulin and testosterone, two anabolic hormones needed for growth and recovery.
- Cortisol reduces insulin sensitivity, and inhibits glucose uptake into muscle (Geer et al., 2015)
- Cortisol spikes in the evening make it tough to get good sleep (Hirotsu et al., 2015)

Cortisol forms part of the Hypothalamic Pituitary Adrenal (HPA) axis, the hormonal network which regulates stress. The ECS is also involved in regulating the HPA axis, through CB1 receptors found on the hypothalamus and pituitary gland. This enables the ECS to put the brakes on the HPA axis to resolve stress. Cannabinoids are also a way of reducing stress,

and CBD has been shown to reduce corticosterone (cortisol) (Crippa et al., 2018) in animals. CBD has also been shown to influence cortisol release in humans (Zuardi, Moriera 1993), which may help resolve stress.

This may be due to CBD's ability to increase the brains natural cannabinoid, Anandamide. Anandamide activates the CB1 receptor in the hypothalamus, which may cause a downstream reduction in cortisol secretion from the adrenals (Crippa et al., 2018).

In support of this, CBD has been shown to lessen anxiety (Zuardi et al., 1993), (Crippa et al., 2011), (Linares et al.,2019), (Bergamaschi et al., 2011) and improve sleep in people with sleep disorders (Chagas et al., 2014), (CARLINI and CUNHA, 1981), (Shannon et al., 2019. CBD's ability to improve sleep has been partly attributed to its ability to lessen anxiety, and perhaps by reducing cortisol.

The other way CBD helps sleep is by enhancing REM sleep (Pisanti et al., 2017a), the stage of sleep which is important for learning, memory and mood and for replenishing the brain and bodies energy.

Other mechanisms by which may CBD reduce anxiety:

- CBD activates 5HT1A to regulate serotonin signalling, which may reduce anxiety (Ligresti, De Petrocellis and Marzo, 2016).
- CBD increases to sensitivity of GABA signalling to lessen anxiety (Blessing et al., 2015)
- CBD promotes adenosine A2A signalling which may reduce anxiety (Maroon, Bost., 2018)
- CBD activates TRPV1 receptors which may reduce anxiety (Papagianni, Stevenson., 2019)

In summary, CBD may lessen the risk of overtraining, and reduce the overall impact of physical and mental stress on training and performance.

"I'm right on-board. I'll use a lower amount for a nap, like I'll use like 40, 50 milligrams for a nap and then in doses above 100 for sleep"
Ben Greenfield

CBD & Metabolism

The science is still in its early stages when it comes to how CBD affects metabolism and body composition. Sure, there's some interesting studies in cells and animals, but this has not translated to/been shown in humans.....yet.

So with that disclaimer out of the way, let's take a look at how CBD may pitch in here.

It all starts with the Endocannabinoid system (ECS), which we know regulates food intake, body weight, and energy balance.

The ECS tightly co-ordinates the desire to eat, and the digestion and metabolism of nutrients from food. It does this by controlling the activity of organs that govern appetite and metabolism (Horn et al., 2018):

- **Hypothalamus (brain) - appetite and global metabolic rate**
- **Liver - cholesterol synthesis, glucose uptake, storage and synthesis, fat burning**
- **Muscle - glucose uptake and use, fat burning**
- **Fat tissue - glucose uptake, fat storage, fat burning**
- **Pancreas - insulin release**
- **Gastrointestinal tract - speed of food transit, nutrient absorption**

Cannabinoid receptors are found on these organs, which allows the ECS to turn appetite and metabolism up or down.

Specifically, Cannabinoid receptor 1 (CB1) has been shown to exert the most influence over how much a person eats (Kirkham 2005), how much of it they store, and the rate at which they burn it off.

Research has actually found that people with an overactive ECS are overweight and diabetic (Matias et al., 2012). This is because they have a high level of CB1 receptor activation, which turns appetite up and metabolism down. They tend to eat more, store more energy as fat and burn less energy off than people with a less active ECS.

They are also less sensitive to the hormone insulin, so their muscles don't receive an efficient supply of energy to perform exercise. They also don't burn fat well, which means they tend to have a reduced capacity to make energy, and are often fatigued as a result.

What the ECS is trying to do here is conserve as much energy as possible by increasing the desire to eat, storing as much energy as possible, and burning as little as possible. This adaptive mechanism would have protected us against starvation when food was scarce, and maximised the intake and efficiency of energy when we did find food.

However, the problem nowadays is that there is always food around. A lot of us don't eat 'real' food anymore, and such junk food revs up the ECS so it becomes overactive (Kuipers et al., 2018) (Erlanson-Albertsson,Lindqvist., 2010). So what we have is a situation where the ECS is tricked into thinking it needs to constantly be conserving energy by holding onto it.

Now I'm sure many of you reading this are very fit and healthy, but maybe you have clients who struggle with their weight and metabolic health.

The key here is to help them turn down their ECS activity so that their bodies naturally want to eat less and burn more energy.

This is where CBD could be potentially useful, because it can bring the ECS back into equilibrium. CBD works in a way that is unique to each and every individual, helping them restore their own balance.

Herbs that do this are called adaptogens, and CBD is one of them.

So, for an overweight client with an overactive ECS, CBD may help to reduce its activity so they eat less and burn more.

Remember we said that people with obesity and diabetes have a high level of CB1 activation. Well, CBD can actually block the CB1 receptor from being (over)activated (Chung et al., 2019). So the signals the ECS sends to conserve energy are blocked by CBD (theoretically).

There haven't been any human studies to back this up, but the mechanisms are there, and research in animals is encouraging.

Since CBD can turn down the ECS, it may have an effect on how energy from food is absorbed, stored and burned.

CBD has been found to reduce appetite and food intake in rats (Farrimond et al., 2012), and reports of side effects with clinical trials using CBD have reported reduced appetite with CBD (Thiele et al., 2018), (Devinsky et al., 2016).

CBD also reduced body weight gain in rats when they were continuously given it for 14 days (Ignatowska-Jankowska et al., 2011). This reduction in body weight is supported by how CBD affects fat cells and how they store and burn fat.
There are different types of fat in the body; brown and white fat. White fat is specialised for storing fat, whereas brown fat is more adept at burning it.

CBD can actually help shift fat cells to the more beneficial brown fat type. CBD was shown to activate genes that handle fat breakdown, whilst also inhibiting the proteins which make new fat cells. Also, CBD increased the number of mitochondria and their activity (Parray & Yun 2016), which improves the body's ability to use energy.

Other cannabinoids that block the CB1 receptor

have also been found to increase fat burning, increase energy use and reduce fat mass and food intake in obese mice (Jbilo et al., 2005), (Liu et al., 2005).

The increases in energy expenditure may also be due to changes in thyroid function. Blocking the CB1 receptor has been shown to control release of thyroid hormones (T3) and (T4) (Porcella et al., 2002), (Horn et al., 2018), (Pagotto et al., 2006) which are important for regulating metabolism.

CBD also increases good cholesterol (HDL) by 55% and reduces total cholesterol by 25% in obese mice (Iffland, Grotenhermen.,2017), which may be due to better insulin signalling in the liver.

What's also interesting is that the rates of diabetes and obesity are also lower in people who use Cannabis, according to studies of the general population. Cannabis use is associated with a lower BMI, and better blood sugar regulation (Le Strat, Le Foll., 2011). Cannabis use was associated with lower fasting insulin, insulin resistance and waist circumference (Penner et al., 2013).

This could be a sign that CBD (or cannabinoids as a whole) can be effective for managing body composition and metabolism. Not to mention CBD's powerful antioxidant and anti-inflammatory effects, which also pitch in to help keep a healthy body weight and metabolism.

The jury is still very much out on how CBD may benefit people's metabolic health, so we've got to wait for clinical trials to confirm any basic science stuff we've seen so far.

The ECS tightly co-ordinates our desire to eat, & the digestion & metabolism of nutrients from food

Mighty Green has a range of the highest quality oral CBD Drops, topical balms, Cannablissful massage oils

How To Use CBD (if you're a trainer)

There's more than one way to use CBD, and they each have their merits depending on what you want to get out of it.

Topical Delivery of CBD

Using CBD topically is well suited for more physical aspects of health and fitness, such as alleviating chronic aches, pains, and spasms after hard training.

I like to think of topical CBD working from the outside in, whereas taking it orally works from the inside out.

CBD is usually taken as oral drops, but can also be applied through the skin.

CBD doesn't have the same widespread effects as when it's taken orally, since it doesn't enter the bloodstream. This comes with some upsides, and a couple downsides when compared to oral delivery.

The Good

• CBD is more bioavailable when applied through the skin, since the liver doesn't break it down.
• The effects are highly concentrated to the area it is applied.
• Less likely to test positive on a drugs test, as the small amounts of THC in most CBD extracts do not enter the bloodstream as readily as ingesting it.

The not as good

• The effects of CBD are localised to the area its applied on the body.
• It may not pose the same benefits on the brain and psychological conditions. At least not directly.

How CBD Works through the Skin

Both the dermis and the epidermis are home to cannabinoid receptors (CB1 & CB2), which control the ECS.

The ECS is found also found on the body's extremities, and naturally maintains skin health, inflammation, pain and sensitivity through CB receptors.

However, sometimes the ECS needs a hand in regulating pain and inflammation, notably after exercise.

Here's where CBD comes in; it boosts the levels of endocannabinoids that are available to bind to CB receptors on sensory nerves, skin cells and immune cells, to reduce pain, inflammation, and nourish the skin.

The benefits specific to using topical CBD are:
• Muscular relaxation.
• Localised relief of pain.
• Rejuvenating skin (chafing, blisters and sores).
• Muscle recovery and to combat soreness.

Our Mighty Green Muscle Balm and Cannablissful massage oils are very popular with sport and exercise therapists.

A massage oil can either be used for a specific body part, or the whole body.

To use our Cannablissful massage oils:

• Shake well before use, apply 5ml to clean palms to warm and activate the oil.
• Spread across the body, or to a specific area if desired.
• Apply more if needed.
• Wait 15-45 minutes for effects to sink in.

If I'm lucky enough to find someone who'll give me a massage, I like to use Cannablissful Soothe blend on targeted areas to speed muscle recovery and reduce soreness. This works really well as a deep tissue or sports massage.

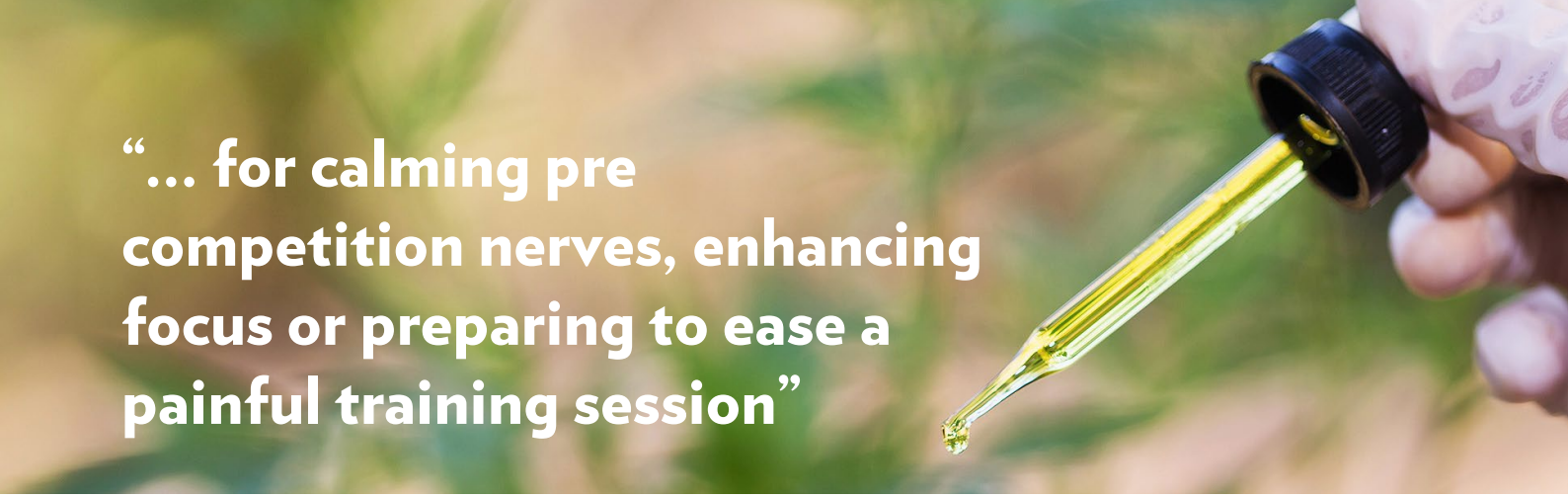
Our balms can be used like an oil, but have a higher concentration of CBD.

Mighty Green's muscle balms provide a stronger grip, and lower glide than massage oils. They are ideal for treating specific areas of the body, since they can be applied with more control and precision.

Cannablissful massage balm has been designed to provide concentrated CBD, magnesium and essential oils for targeted relief of pain and to stimulate muscle relaxation.
Magnesium is truly a synergistic ingredient when combined with CBD. It helps regulate muscle contractions, and without enough of it muscles may contract, spasm or cramp. Ensuring a healthy delivery of magnesium through the skin as well as in your diet helps keep you and your muscles relaxed.

Start with a small serving on the tip of your finger, about 2.5 ml should do it. This provides a serving of ~ 25mg CBD. Apply more for greater relief (additional 2.5ml).

I like to use the balm on my joints after long runs or plyometric and explosive training, it keeps them from stiffening and helps reduce pain and soreness the days after. This helps me cycle through my training nicely, and means I can launch into the rest of the week's training with a spring in my step.



"... for calming pre competition nerves, enhancing focus or preparing to ease a painful training session"

Taking CBD Orally

Taking CBD orally is especially suited to the mental components of health, performance and competition. Taking CBD internally allows it to circulate the blood stream, and target the brain for a direct effect on stress, sleep and focus.

There are four main ways CBD can be incorporated into your lifestyle:

- Preparation for training or competition
- During training or competition
- For recovery
- For general health and wellbeing (standard dosing morning and night)

Oral Drops

When CBD is taken orally, it is most commonly taken under the tongue as oral drops. This is one of the faster acting methods of taking CBD, which usually kicks in around 20-30 minutes after dosing and lasts up to 6 hours.

Taking oral drops is ideal for calming pre competition nerves, enhancing focus or preparing to ease a painful training session. They're also a great option if you want to ensure a restful sleep before game day, or after a heavy workout where you need deep and restorative sleep.

After strenuous weight training, I like to take oral drops to offset the stress response that has occurred after the session. I find this particularly useful, as I often workout at night and it sometimes interferes with my sleep.

I'd typically take 20mg a couple hours after training. So probably getting in about 30 - 40mg from when I finish training to just before I go to bed.

Bioavailability of oral drops also tends to be on the higher end, at around 12-35% (Schoedel, Harrison., 2012). This effectively means that up to 35% of the CBD taken sticks around to exert an effect. Mighty Green oral drops have been

formulated to maximise bioavailability, with the use of MCT oil.

MCT stands for medium chain triglycerides, which are a great carrier for CBD. They are super absorbable when taken sublingually, and bypass digestion in the intestine (compared to capsules). This gives you the best chance of getting the most out of your CBD.

A lot of people choose to manage their stress and sleep with oral drops because of their rapid onset and ease of use. If I wake up during the night, I have a few drops to whisk me back off to sleep quickly and easily.

Dosing Guide

1. Understand CBD mg's

CBD packaging can seem confusing with various percentages and total mg's... The key is to know how many mg of CBD are in each drop so you can be very precise.

Here's a summary of our 10ml oils which contain a total of 200 drops per bottle:

- 2% 200mg equates to 1mg CBD per drop
- 5% 500mg equates to 2.5mg CBD per drop
- 10% 1000mg equates to 5mg CBD per drop
- 20% 2000mg equates to 10mg CBD per drop

Our most popular starter oil is 2% with culinary sweet orange extract.

2. How To Take CBD

CBD is best consumed sub-lingually. Encourage clients to hold the oil there as long as they can.

3. Start Low and Go Slow

If you're new to CBD, then it's best to start low and go slow. We want to slowly activate the Endocannabinoid System to get the best response from it.

Some people may notice improvements immediately, for others it may take 10 days for the ECS to 'wake up'.

Days 1-5

5mg CBD in the morning
5mg CBD in the evening (especially if there are any sleep issues)

Days 6-10

10mg CBD in the morning
10mg CBD in the evening

After Day 10

The ECS should be activated, and now you can use CBD in training and lifestyle specific ways. You can continue with morning and evening dosages, or dose in response to your training needs (eg muscle recovery, sleep aid, focus and flow hacking).

A few dosing examples:

• 20mg in the morning and 20mg in the evening.
• 10mg in the morning, 10mg before training, 20mg before bed.
• 10mg before training, 20mg after training, 20mg before bed.
• 10mg in the morning, 5mg before training, 5mg during training, 20mg after training/before bed.

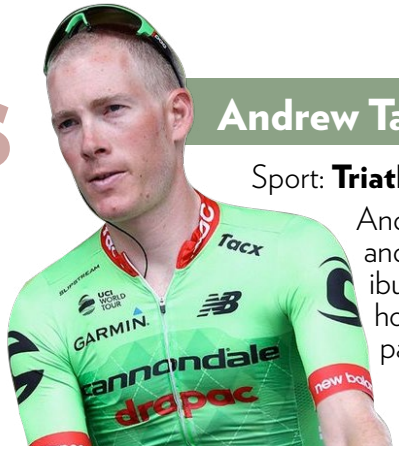
Some people may require higher doses based on their individual needs. There is no established tolerable upper limit for CBD as yet, but Cannabis Pharma have recommended their food supplement for adults at a daily intake of up to 130 mg or 1.86 mg/kg CBD (Tesisenred.net, 2019).

which brings us to point 4:

4. Use the Mighty Green Dose/ Response Tracker.

Some people may want to increase the dose in response to individual lifestyle and training demands. We encourage you to use the tracker to help you understand how CBD is helping you.

Who Uses CBD?



Andrew Talansky

Sport: **Triathlon**

Andrew uses CBD for pain and Inflammation. He ditched ibuprofen after he discovered how CBD helped his hip pain after injury.

Lolo Jones

Sport: **Olympic Bobsled**

"Because I'm a 37-year-old Olympian. I need all the help I can get. When I wake up in the morning, I feel like an 80-year-old sometimes. I've aged in dog years."

Terrell Davis

Sport: **NFL**

Terrell mentions that he has no more inflammation in his body, his knee, and his joint pain is gone. He hasn't taken migraine medicine for over a year.

Nate Diaz

Sport: **MMA**

Nate uses CBD for managing inflammation and stimulating the healing process.

Ben Greenfield

Sport: **Triathlon**

Ben uses CBD to get deep and restorative sleep. He takes large doses of up to 100mg

David Wells

Sport: **Baseball**

Like many athletes, David used to take painkillers like percocet to manage the demands of competing at a high level. He continued using painkillers even after his career ended. Since David discovered CBD, he hasn't touched an opioid since.

Riley Cote

Sport: **NHL**

Riley uses CBD to manage pain so that he can get restful and restorative sleep

John Isner

Sport: **Tennis**

"I play a sport where taking a single point off can be the difference between winning and losing a match and Defy (CBD) is a product specifically intended to put me in a position to perform on every single point,"

Ker Walsh Jennings

Sport: **Olympic Beach Volleyball**

Since Ker started using CBD, she has noticed an improvement in her sleep and overall wellbeing.

Bubba Watson

Sport: **Golf**

Bubba uses CBD to ensure good sleep, and to prevent against tightness and injury.

Ken Block

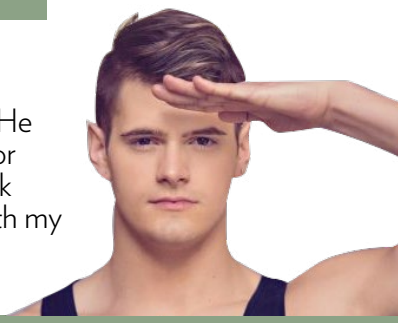
Sport: **Rally**

Ken likes to start his day off wit a few drops of CBD in his coffee. He says "It's the ideal combination for getting focused and back to work after playing out in the dunes with my family all weekend"

Brock Cannon

Sport: **Ultra Running**

Brock was taking 12 ibuprofen per day to aid in his recovery and to deal with knee pain, and it was in the summer of 2015 where he found drastic relief in the full plant extracts of the cannabis plant and particularly CBD oil.



Caleb Marshall

Sport: **Fitness Trainer**

Caleb takes 15 milligrams of CBD in the morning and 30 milligrams at night to manage anxiety and inflammation, in addition to topical muscular salves and creams for a chronically sore body

James Lewis

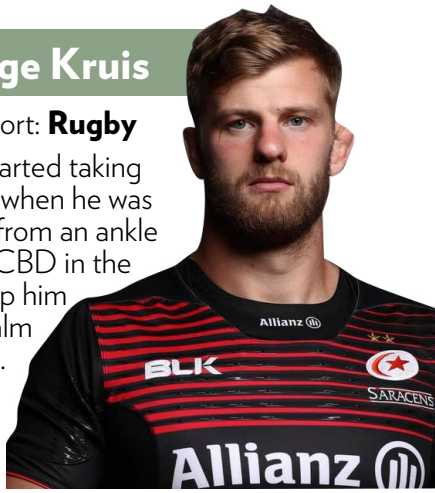
Sport: **Bodybuilder**

James body takes a hit on a daily basis. He found that using CBD gives him relief from inflammation and aids in recovery.

George Kruis

Sport: **Rugby**

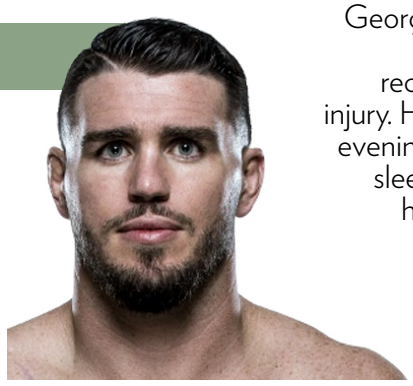
George first started taking CBD oil when he was recovering from an ankle injury. He takes CBD in the evenings to help him sleep and calm him down.



Chris Camozzi

Sport: **MMA**

Chris first started using CBD to aid recovery from a torn MCL. " I was recovering faster after workouts, less sore, less down time, able to rebound... Even the bursitis in my shoulder feels better. I know even telling the story it sounds crazy but that is how incredible and noticeable this was..."



Jamie O'Brien

Sport: **Surfing**

Jamie uses CBD to help him recover from long days surfing. He gives thanks to CBD for keeping him pain free in his active lifestyle.

Ryan Sheckler

Sport: **Skateboarding**

Ryan uses CBD daily, to stay relaxed and to help his body heal.

Legalities in Sport

In 2018, CBD was excluded from the WADA (World Anti-Doping Agency) list because it doesn't have psychoactive properties. That's a big win for athletes who want to optimise their recovery, support their physical and mental well-being and perform at their best.

It is worth noting that the psychoactive part of cannabis (THC) can accumulate in the body after repeated use, and may be picked up by certain tests. What's important to also remember though, is that a lot of CBD products are what's known as full spectrum products - they still contain a minute concentration of THC. Whilst small concentrations of THC (<0.2% per product) are legally permitted, repeated use of these products may pose a risk to athletes who want to stay clean, but still use CBD.

Mighty Green's broad spectrum CBD products on the other hand contain very low concentrations of THC (<0.05%). So you still get the CBD and other great stuff from hemp, just without the THC.

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