

INDEPENDENT EFFICACY ANALYSIS
OF MISSION BLENDS

MISSION
FUEL YOUR EXTRAORDINARY

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INTRODUCTION

This special report will aim to determine how the particular ingredients included in the range of MISSION's range of products impact the following three concepts affecting athletic performance:¹

1. Beating the crash (providing an alternative to high-sugar, high-caffeine energy drinks by promoting metabolic flexibility to prevent the “hitting the wall” phenomenon).
2. The use of low dose caffeine as an ergogenic aid.
3. Improving cognitive performance.
4. Reducing inflammation to hasten recovery.

This introduction focuses on possible alternatives to the high-sugar and high-caffeine elements of available energy drinks that aim to improve athletic performance.

To do this, we introduce the concept of “beating the crash”, and specifically how MISSION could promote metabolic flexibility by switching from reliance on carbohydrates to a greater reliance on fats for the provision of sustained-energy in athletic performance, avoiding the crash from high-sugar energy drinks.

We also discuss the use of caffeine as an ergogenic aid and the merits of using low-dose caffeine supplementation to improve performance as opposed to the high-caffeine content in other energy drinks, avoiding the caffeine crash.

Later, this report also highlights the mechanisms of how certain individual ingredients might improve both performance-determining cognitive outcomes and time to recovery by mitigating inflammatory damage.

¹ This will be based on the following key issues from the International Society of Sports Nutrition (ISSN) in assessing the value of an ergogenic (performance enhancing) supplement: 1

1. How does the supplement work and does this make sense?
2. Is there any scientific evidence to support this?
3. Is the supplement safe and legal?

THE SUGAR CRASH

There is one phenomenon known almost universally to endurance athletes, and it is one that a lot of time, training and money is spent trying to avoid. This is the phenomenon known as “the sugar crash”, which in scientific terms represents carbohydrate depletion. ² So what actually happens when you crash?

THE SCIENCE BEHIND THE CRASH

The mechanism behind the crash you feel after having something with a high sugar content has to do with two hormones, insulin and glucagon. ^{2,3} In basic terms, glucagon increases blood sugar levels and insulin lowers them. ^{2,3} When you have something with a high sugar content (and therefore a high glucose content), your blood sugar initially skyrockets and your body consequently produces a large amount of insulin to deal with all this excess sugar. ^{2,3} However, this large amount of insulin causes your blood sugar to fall rapidly, which makes you feel sluggish and tired and is the reason why you “crash”.

In this regard, high-sugar, high-caffeine energy drinks will aim to help an athlete avoid the crash by providing a top-up of readily available carbohydrates (i.e. sugar); however, there are only so many carbohydrates your body can store before it runs out again, leading to another crash requiring another top-up, which results in this “crash and burn” cycle. ^{2,3} Naturally this has a negative effect on your overall athletic performance.

HOW TO BEAT THE CRASH

In order to beat the crash one needs to rework how the body metabolises fuel. What does this mean? Simply put, metabolism is the process of breaking down fuel (e.g. carbohydrates, fats, and proteins from food) to create energy. ³ Certain fuels, such as carbohydrates, are relatively easy for your body to metabolise (break down) and can be quickly converted into energy. ^{2,3} This means that carbohydrates can be used to generate high levels of energy over a short period of time. ^{2,3} Other fuels, such as fats, are more complex and take longer for your body to metabolise, which means that they release more moderate amounts of energy but over a longer period. ^{2,3}

So when it comes to athletic performance, especially in endurance events, this distinction is crucial. Part of how regular exercise enhances your endurance capacity is by delaying the depletion of your carbohydrate stores through switching your muscle fibres from the types that use carbohydrates as their primary source of energy to those that primarily use fats instead (Figure 1). ²

This provides extra energy for extended performance and saves your carbohydrate stores for high-intensity bursts when you need a lot of energy quickly, and which can be performance-determining (Figure 2). ²

This switch from carbohydrate-dependent to fat-dependent metabolism is what we mean by metabolic flexibility.

In the following report we detail how the various ingredients in MISSION's blends enhance your metabolic flexibility in our attempt to break the wall and present an alternative to traditional high-sugar, high-caffeine energy drinks.



Figure 1 (taken from Fan et al, 2017):² Here, PPAR δ acts as the switch that causes muscles primarily to rely on fat metabolism (green) instead of carbohydrate metabolism (yellow), sparing glucose stores and boosting performance. ATP refers to the molecular form of energy used by muscle cells.

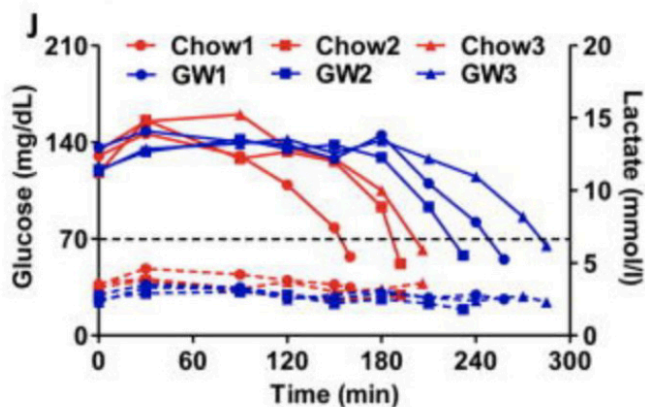


Figure 2 (taken from Fan et al, 2017):² Blood glucose (solid lines) and lactate (dotted lines) monitored during the run-to-exhaustion endurance test in mice treated with or without GW (Here, "GW" activates PPAR δ which causes the switch that makes muscles rely more on fat metabolism for energy, preserving glucose stores and helping these "GW" mice to run for longer).

THE CAFFEINE CRASH

Ever since the World Anti-Doping Agency removed caffeine from the banned substances list in 2004, there has been a flurry of activity looking into how it can be used to enhance athletic performance.^{4,5} The ISSN currently recognises that caffeine is effective for enhancing sport performance in trained athletes when consumed in low/moderate doses, and notes that the consumption of energy drinks (containing ± 2 mg/kg of caffeine) 10-40 mins prior to aerobic exercise can improve cycling and running performance in both trained and recreationally-active participants.¹

The issue is that most athletes derive their caffeine from commercially-available sports drinks and coffees, in which the caffeine content can vary widely from 25 to almost 400mg.

¹ For example, a venti filter coffee from Starbucks in the UK contains 387mg of caffeine.⁶ Furthermore, improvements in performance related to these energy drinks can often be the result of other ingredients in addition to caffeine.^{1,4} What are the benefits and risks of caffeine and how does this affect athletic performance?

Caffeine acts primarily on the central nervous system, blocking Adenosine receptors in your brain which increases the levels of dopamine in your system.^{7,8} The benefits of this include:⁸

- Enhanced endurance capacity, and;
- Improved vigilance and reduced pain perception.

It essentially helps you to go harder, for longer, without losing concentration.

The problem is that with higher doses of caffeine, more of your adenosine receptors are blocked meaning that when the effects of caffeine wear off, accumulated adenosine floods these now open receptors making you feel a crash.^{7,8}

LOSS OF PERFORMANCE

Other problems with taking large, one-off doses is that this increases your risk of tremors, diarrhoea, headaches, poor sleep and withdrawal-induced lethargy.^{5,7}

WHAT'S THE RIGHT AMOUNT OF CAFFEINE?

The benefit of caffeine is also highly variable between individuals, which means that low doses (1.5-3 mg/kg) taken immediately before, and regularly during exercise may actually be a more effective way of boosting performance.^{5,8} In this regard, MISSION's range of performance teas all have between 11 and 19 mg of caffeine per serving, which allows for regular, low-dose caffeine supplementation. On this basis, a recommended regimen of MISSION (Table 1) has been designed to provide a low-dose, sustainable energy release, helping to enhance energy metabolism during the day as well as improve sleep quality at night, in order to benefit athletic performance.

| WEIGHT (KG) | RECOMMENDED REGIMEN (NUMBER OF SERVINGS) | TOTAL CAFFEINE (MG) |
|-------------|--|---------------------|
| 50 | 1 Energise, 1 Focus, 1 Perform, 1 Endure, 1 Recover, 1 Sleep | 60 |
| 55 | 2 Energise, 1 Focus, 1 Perform, 1 Endure, 1 Recover, 1 Sleep | 79 |
| 60 | 2 Energise, 1 Focus, 2 Perform, 1 Endure, 1 Recover, 1 Sleep | 93 |
| 65 | 2 Energise, 1 Focus, 2 Perform, 2 Endure, 1 Recover, 1 Sleep | 105 |
| 70 | 2 Energise, 1 Focus, 3 Perform, 1 Endure, 1 Recover, 1 Sleep | 107 |
| 75 | 2 Energise, 2 Focus, 2 Perform, 1 Endure, 1 Recover, 1 Sleep | 113 |
| 80 | 2 Energise, 1 Focus, 1 Perform, 1 Endure, 1 Recover, 1 Sleep | 120 |
| 85 | 2 Energise, 2 Focus, 3 Perform, 2 Endure, 1 Recover, 1 Sleep | 122 |
| 90 | 3 Energise, 1 Focus, 3 Perform, 1 Endure, 1 Recover, 1 Sleep | 126 |

Table 1: Recommended regimen of MISSION to provide ± 1.5 mg/kg caffeine per day. NB: if no other caffeinated products taken.

References:

1. Porrini, M. & Bo', C. D. Ergogenic Aids and Supplements. *Sports Endocrinol.* 47,128-152 (2016).
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4. Souza, D. B., Del Coso, J., Casonatto, J. & Polito, M. D. Acute effects of caffeine-containing energy drinks on physical performance: a systematic review and meta-analysis. *Eur. J. Nutr.* 56 , 13-27 (2017).
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8. Peeling P, et al. Evidence-Based Supplements for the Enhancement of Athletic Performance. *International Journal of Sport Nutrition and Exercise Metabolism .* (2018) 28, 178-187. <https://doi.org/10.1123/ijsnem.2017-0343>

INGREDIENTS LIST

ENERGISE: COCOA + GINGER

2.5g SERVING LOOSE LEAF

Ingredients: Chinese Chunmee Green tea (44%), Cocoa nibs (16%), Ginger (16%), Beetroot, Liquorice, Green Cardamom, natural flavouring.

FOCUS: GUARANA + BEETROOT

1g SERVING OF MATCHA POWDER

Ingredients: Organic Ceremonial Grade Japanese Matcha Green Tea (47%), Guarana, Cayenne, Pea Protein, Rice Protein, Ginger, Beetroot, Green Cardamom, natural flavouring.

PERFORM: LEMONGRASS + MINT

2.5g SERVING LOOSE LEAF

Ingredients: Chinese Sencha Green Tea (54%), Yerba Maté (12%), Spearmint (10%), Siberian Ginseng, Schizandra berries, Gotu Kola, Lemongrass, natural flavouring.

ENDURE: ORANGE + MACA

1g SERVING OF MATCHA POWDER

Ingredients: Organic Ceremonial Grade Japanese Matcha Green tea (36%), Yerba Maté (12%), Baobab, Cinnamon, Maca, natural flavouring, Pea Protein, Liquorice, Siberian Ginseng, Orange Peel.

RECOVER: BERRY + ASHWAGANDHA

2.5g SERVING LOOSE LEAF

Ingredients: South African Rooibos (53%), Hibiscus, Apple Pieces, Rosehip, Ashwagandha, Tulsi, Strawberry, Ginkgo Biloba, Blackcurrant, Valerian, Lavender, natural flavouring.

SLEEP: TURMERIC + LAVENDER

1g SERVING OF MATCHA POWDER

Ingredients: South African Rooibos Matcha (30%), Turmeric (38%), Ginger (15%), Hemp Protein, natural flavouring, Ginkgo Biloba, Lavender.



MISSION

ENERGISE

This blend is designed to be taken at the start of the day as a replacement to high sugar, high caffeine energy drinks or coffee. This blend is designed to enhance your metabolic flexibility by switching your muscles to rely more on fat for energy production instead of carbohydrates. Green Tea and Ginger are the primary ingredients that affect this. Beetroot and Cocoa are then included to improve your cardiovascular efficiency, meaning that your heart and skeletal muscles are able to more effectively convert this raw energy into power. Finally, Green Cardamom and Liquorice are included to help reduce inflammation, thereby helping to keep your muscles performing at their peak capacity.

INGREDIENTS (per 2.5g loose leaf serving) : Chinese Chunmee Green tea (44%), Cocoa nibs (16%), Ginger (16%), Beetroot, Liquorice, Green Cardamom, and natural flavouring.

FUNCTIONS OF SELECTED INGREDIENTS:

GREEN TEA

Promotes metabolic flexibility (using fats instead of carbs) and reduces harmful inflammation.

GINGER

Promotes metabolic flexibility (using fats instead of carbs) and acts as a pain reliever.

BEETROOT

Improves cardiovascular efficiency.

COCOA NIBS

Improves cardiovascular efficiency and cognitive function.

GREEN CARDAMOM

Reduces harmful inflammation.

LIQUORICE

Reduces harmful inflammation and protects against infection.

| TYPICAL VALUES | PER 100ML |
|---------------------------|----------------|
| Energy | 0kj 0kcal |
| Fat of which saturates | <0.5g <0.1g |
| Fat of which sugars | <0.5g <0.5g |
| Fibre | <0.5g |
| Protein | <0.5g |
| Salt | <0.01g |

Table 2: Nutritional information for Energise (contains 19mg caffeine).



The benefits of Green Tea to athletic performance centre around:¹⁻³

- Getting new energy into highly-active cells (e.g. muscles), and;
- Helping to prevent cellular damage post-exercise and hasten recovery.

HOW DOES GREEN TEA GENERATE NEW ENERGY?

The main benefit of Green Tea on athletic performance is improved metabolic flexibility, which helps to generate new energy through:

- Improved fat metabolism (allowing your body to derive more fuel from fat instead of carbohydrates).
- Improved glucose tolerance, insulin secretion and sensitivity (enabling your body to more efficiently process this fuel).
- Increased mitochondrial ATP production (helping your muscle to generate power from this new energy derived from fat).

This occurs through an ingredient called epigallocatechin-3-gallate (EGCG), which gets converted into gallic acid (GA) in the gut. ¹ GA has been shown to stimulate a receptor present in metabolically-active tissues (those using large amounts of energy such as muscle tissue) called GPRG6A, which has a number of beneficial effects that have been suggested to enhance athletic and cognitive performance. ¹

HOW DOES GREEN TEA HASTEN RECOVERY?

Green Tea helps to prevent cell damage by reducing harmful inflammation, through inhibiting inflammatory cytokine production (meaning a faster recovery with less muscle damage).

The mechanism behind these benefits has to do with the process of oxidative stress. ^{1,2} When a tissue is working hard, cells generate harmful molecules called reactive oxygen species (ROS) as a by-product, which are then usually mopped up by antioxidants. ² When the generation of ROS exceeds the physiological capacity of the antioxidant system to render them inert, damage occurs. ² Tea catechins and polyphenols are known to have significant antioxidant properties, and in one study Green Tea extract given as a supplement over 4-weeks to weight-trained athletes increased blood antioxidant levels and reduced markers of oxidative damage in both acute high-intensity and long-term muscular endurance tests. ²

A follow-up study found that two 250 mg Green Tea extract supplements (each containing 137 mg of EGCG), given twice daily (total Green Tea dose 1g) to individuals undergoing



high-intensity sprint training, improved antioxidant levels, attenuated oxidative damage during the recovery period, and preserved the training-induced adaptive response to oxidative stress known to increase antioxidant enzyme gene expression. ²

GETTING THE RIGHT AMOUNT OF EGCG

Studies have noted that there is a high degree of variability in metabolic response (how efficiently your body uses energy) seen with Green Tea supplementation, and dosage is thought to be a key factor in this by helping to achieve the correct GA to EGCG ratio. ¹⁻³ GA stimulates the receptor GPRG6A while EGCG inhibits it, therefore providing enough EGCG to be converted into GA but not too much that it will inhibit GPRG6A is crucial in order to see the benefits of Green Tea supplementation. Taking 1-10 servings of MISSION daily has been shown to be within the optimal amount according to studies. ¹⁻³

References:

1. Pi, M. et al. GPCR6A Is a Molecular Target for the Natural Products Gallate and EGCG in Green Tea. *Mol. Nutr. Food Res.* 62 , 1700770 (2018).
2. Jówko, E., Długołęcka, B., Makaruk, B. & Cieśliński, I. The effect of Green Tea extract supplementation on exercise-induced oxidative stress parameters in male sprinters. *Eur. J. Nutr.* 54 , 783-791 (2015).
3. Tsai, T.-W. et al. Effect of Green Tea extract supplementation on glycogen replenishment in exercised human skeletal muscle. *Br. J. Nutr.* 117 , 1343-1350 (2017).



Ginger is a well-known spice derived from the *Zingiber officinale* plant that has been used for centuries in non-western traditional medicine. Its use as a performance enhancer in sport is starting to be investigated, and its principal benefits in this regard are its ability to:¹⁻³

- Promote metabolic flexibility, through switching muscles to fat-dependent as opposed to carbohydrate-dependent metabolism.
- Act as an analgesic (pain reliever).

HOW DOES GINGER WORK TO SWITCH MUSCLES FROM USING CARBOHYDRATES TO FATS?

Ginger influences a key pathway in the concept of metabolic flexibility which is regulated by something called PPAR δ (see *Beating The Crash*). PPAR δ is present in highly-active tissues such as skeletal muscle, and it functions to regulate the use of energy in these tissues, helping to switch these muscles of being dependent on carbohydrates for energy to being more dependent on fats.^{2,4} By increasing fat metabolism in skeletal muscles, Ginger extract supplementation has been shown to improve exercise endurance capacity and reduce diet-induced obesity.² This, in combination with reports that Ginger enhances testosterone during exercise production suggests that Ginger has the potential to provide significant ergogenic benefits for athletes and other high performers.³

HOW DOES GINGER ACT AS A PAIN RELIEVER?

Most athletes, including up to 70% of endurance athletes competing in triathlons, marathons and ultramarathons report using non-steroidal anti-inflammatories (NSAIDS e.g. Advil, Ibuprofen, etc.) for pain relief on a regular basis.¹ However, NSAIDS have been shown to have a number of harmful side-effects including:¹

- Gastrointestinal (GI) dysfunction (resulting in diarrhoea, cramping, and a prolonged inflammatory response).
- Bronchoconstriction (making breathing more difficult).
- Impairment of connective tissue repair.
- Prevention of protein synthesis (reducing muscle regeneration post-exercise).
- Increased risk of cardiovascular events.

Ginger, on the other hand, taken at a dose of 2 g/day for 5 days, has been shown to:¹

- Act as an analgesic (pain reliever), through:
- Reducing muscle pain.



-
- Improving GI function (less cramping and diarrhoea).
 - Reducing inflammation and accelerating recovery.

It does this through a similar mechanism to NSAIDS (by blocking a series of enzymatic pathways) but additionally blocks a receptor called Vanilloid 1 which influences pain processing in the central and peripheral nervous system, as well as preventing the release of pro-inflammatory molecules that exacerbate exercise-induced muscle pain.¹

In this regard, each serving (2.5g) of our Energise Tea contains 0.4g of Ginger extract. This means that a 70kg individual ascribing to our recommended regimen of teas benefits from ±1g of Ginger supplementation per day, which taken regularly should provide both pain relief and improved endurance capacity.

References:

1. Wilson, P. B. Ginger (*Zingiber officinale*) as an analgesic and ergogenic aid in sport: a systemic review. *J. Strength Cond Res* 29 , 2980-2995 (2015).
2. Misawa, K. et al. Ginger extract prevents high-fat diet-induced obesity in mice via activation of the peroxisome proliferator-activated receptor δ pathway. *J. Nutr. Biochem.* 26, 1058-1067 (2015).
3. Banihani, S. A. Ginger and Testosterone. *Biomolecules* 8 , (2018).
4. Fan, W. et al. PPAR δ Promotes Running Endurance by Preserving Glucose. *Cell Metab.* 25, 1186-1193.e4 (2017).

BEETROOT



There is a high level of evidence showing that Beetroot improves cardiorespiratory endurance in athletes, with multiple studies showing significant improvements in athletic performance, including: ^{1,2}

- Improved performance at various distances;
- Reduced oxygen consumption;
- Increased time to exhaustion at submaximal intensities;
- Improved performance at anaerobic threshold intensities (meaning that you're able to perform better when your muscles run out of oxygen);
- Improved VO_{2max}

HOW DOES BEETROOT WORK?

More specifically, Beetroot acts as an ergogenic (performance enhancer) by increasing cardiorespiratory efficiency, mainly through increasing the levels of nitric oxide (NO) in your blood. ¹ This has a number of health benefits that serve to improve overall athletic performance including: ¹

- Increased blood flow to highly active tissues (e.g. skeletal muscle)
- Improved gaseous exchange (allowing more efficient oxygenation of tissues)
- Improved mitochondrial ATP production (more efficient energy generation)
- Stronger muscular contraction

HOW TO TAKE IT?

These performance benefits are generally seen 150mins after beetroot ingestion, with peak NO concentrations achieved within 2-3 hours. ²

BEETROOT AT ALTITUDE

Furthermore, Beetroot supplementation has also been suggested to improve performance at altitude (and other low oxygen environments), possibly through reducing the oxygen cost of exercise and improving tissue oxygenation, although further studies will be required to definitively establish this. ³ This is especially true with regular Beetroot supplementation (≥ 15 days). ¹



References:

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While no studies have shown a direct link of Cocoa to improved performance, it has been shown to have a variety of indirect benefits which could enhance performance, including:¹

- Improved cardiovascular efficiency:
- Improved VO₂max potentially improving performance in endurance-type events.
- Improving mitochondrial efficiency (allowing you to produce and use energy more effectively in highly active tissues like the heart and skeletal muscles).
- Reducing oxidative stress (meaning less cell damage and a faster recovery).
- Improved cognitive function.

FLAVANOLS IMPROVE CARDIOVASCULAR FUNCTION.

The compound of interest here is something called flavanols. Cocoa is sourced from the cacao beans of the *Theobroma cacao* tree, and is known to be particularly rich in flavanols which are thought to have blood pressure lowering and antioxidant properties.² This occurs through the formation of a compound called nitric oxide which causes widening of blood vessels and subsequently lowers blood pressure, helping to reduce the risk of cardiovascular disease.² Specifically, one review found that Cocoa products containing 30-1218mg of flavanols produced a small but significant reduction in blood pressure of ± 2 mmHg.² Fresh and fermented cacao beans contain about 100mg of flavanols per 1g of Cocoa. Energise contains 400mg of Cocoa Nibs, providing 40mg of blood-pressure lowering flavanols per serving.²

THEOBROMINE IMPROVES COGNITIVE PERFORMANCE.

Another component of Cocoa with potentially beneficial effects on cognitive performance is theobromine (part of the same family of compounds as caffeine; also found in Cocoa in trace amounts), which has been shown to have stimulatory effects on the central nervous system (CNS), both directly and through improving blood flow to the brain.³ In addition to improving alertness and vigilance, theobromine also has a neuroprotective effect on the CNS, reducing the levels of a substance called A β -amyloid which is thought to be responsible for the development of Alzheimer's Disease.³

A 70kg individual on the recommended MISSION regimen would benefit from 800mg (80mg flavanols) of Cocoa per day.



References:

1. Decroix, L., Soares, D. D., Meeusen, R., Heyman, E. & Tonoli, C. Cocoa Flavanol Supplementation and Exercise: A Systematic Review. *Sports Med.* 48, 867-892 (2018).
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In the same family as Ginger, *Elettaria Cardamomum* (or Green Cardamom) is a spice that reduces inflammation (through increasing antioxidant levels and reducing proinflammatory molecules in the body).¹⁻³

HOW DOES CARDAMOM WORK?

Cardamom contains relatively high quantities of polyphenols, flavonoids and other compounds that act to inhibit the production of proinflammatory molecules (called cytokines) which accumulate in highly active and/or stressed tissues (e.g. skeletal muscles during exercise) and lead to damage which results in inflammation and increases the recovery time of that tissue.³ By inhibiting these molecules as well as a molecule called hydrogen peroxide (a potent generator of harmful oxygen free radicals which causes further inflammatory damage), cardamom protects these highly active tissues.

References:

1. Kazemi, S. et al. Cardamom supplementation improves inflammatory and oxidative stress biomarkers in hyperlipidemic, overweight, and obese pre-diabetic women: a randomized double-blind clinical trial. *J. Sci. Food Agric.* 97, 5296-5301 (2017).
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LIQUORICE



Liquorice is extensively used in Chinese traditional medicine and for good reason.¹⁻³ It has myriad of reported benefits, but those most relevant to improving athletic performance are that it acts as an:²

- Anti-inflammatory.
- Anti-viral.
- Anti-bacterial.

LIQUORICE AS AN ANTI-INFLAMMATORY.

Liquorice contains certain compounds called triterpenoids and flavonoids which inhibit proinflammatory molecules (COX, cytokines, oxygen free-radicals and others) which prevents harmful inflammation.^{2,3} It also acts to change the way cellular DNA is expressed, meaning that your cells read DNA in a way that reduces the number of receptors these harmful inflammatory molecules can bind to on the cell surface.^{2,3} This means that Liquorice helps to reduce your recovery time, getting you back to training faster.

LIQUORICE AS AN ANTIMICROBIAL.

Liquorice also helps to prevent infection by harmful microorganisms (microbes), acting against both viruses and bacteria.^{1,2} By inhibiting the replication and release of viral particles, suppressing the ability of viruses to interact with cells in your body and through activating the immune system, Liquorice helps to act against many viruses, including those responsible for causing the flu and the common cold.^{1,2} Liquorice also helps to act against bacteria by inhibiting their ability to replicate in your body as well as reducing their ability to release harmful toxins.^{1,2} In this way, Liquorice helps to minimise the number of sick days that could potentially derail your training plans.

It is possible to get too much of a good thing though. In large amounts and with long-term use, Liquorice can be toxic. However, the amount of Liquorice in Energise means that you can enjoy the benefits stress-free.²

References:

1. Wang, L., Yang, R., Yuan, B., Liu, Y. & Liu, C. The antiviral and antimicrobial activities of licorice, a widely-used Chinese herb. *Acta Pharm. Sin.* B5, 310-315 (2015).
2. Yang, R., Wang, L., Yuan, B. & Liu, Y. The Pharmacological Activities of Licorice. *Planta Med.* 81, 1654-1669 (2015).
3. Yang, R., Yuan, B.-C., Ma, Y.-S., Zhou, S. & Liu, Y. The anti-inflammatory activity of licorice, a widely used Chinese herb. *Pharm. Biol.* 55, 5-18 (2017).



MISSION

FOCUS

This blend is designed for sustained cognitive enhancement and as a replacement to high sugar, high caffeine energy drinks or coffee. This blend is primarily designed to improve cognitive performance, in which aspect the main ingredients are Matcha Green Tea and Guarana. However, since a major part of staying focussed is having enough energy readily available, this blend uses Ginger, Beetroot and Cardamom to promote metabolic flexibility and provide sustainable energy levels.

INGREDIENTS (per 1g serving of Matcha powder):

Organic Ceremonial Grade Japanese Matcha Green Tea (47%), Guarana, Cayenne, Pea Protein, Rice Protein, Ginger, Beetroot, Green Cardamom, natural flavouring.

FUNCTIONS OF SELECTED INGREDIENTS:

MATCHA GREEN TEA

Improves focus and promotes metabolic flexibility.

GUARANA

Improves cognitive performance and reduces perceived exhaustion.

GINGER

Promotes metabolic flexibility and acts as a pain reliever.

BEETROOT

Improves cardiovascular efficiency.

GREEN CARDAMOM

Reduces harmful inflammation.

| TYPICAL VALUES | PER 100G |
|---------------------------|-------------------|
| Energy | 1357kj 324kcal |
| Fat of which saturates | 4g 0.7g |
| Fat of which sugars | 33g 4.4g |
| Fibre | 17g |
| Protein | 33g |
| Salt | 0.39g |

Table 4: Nutritional information for Focus (contains 15mg caffeine).

ORGANIC MATCHA GREEN TEA



The benefits of Matcha Green Tea on improving focus centre around its high content of L-theanine and of EGCG.¹⁻³

WHAT IS MATCHA AND HOW DOES L-THEANINE HELP FOCUS?

Matcha is a version of Green Tea that is prepared by protecting tea leaves from direct sunlight, and then grinding up the entire leaf into a fine powder.¹ This results in Matcha being the best-grade Green Tea, having especially high amounts of L-theanine compared to normally prepared Green Tea.^{1,2}

L-theanine is an amino-acid found in high concentrations in Green Tea, and especially matcha.¹⁻³ It has a number of reported benefits but most attention has been paid to its ability to reduce stress and anxiety whilst simultaneously improving awareness. 1-3 L-theanine essentially helps to put you in the zone, removing any distractions and focusing your attention on what's important.¹⁻³

HOW DOES EGCG IN GREEN TEA GENERATE NEW ENERGY?

The main benefit of Green Tea in generating new energy is from improved metabolic flexibility, through:⁴⁻⁶

- Improved fat metabolism (allowing your body to derive more fuel from fat instead of carbohydrates).
- Improved glucose tolerance, insulin secretion and sensitivity (enabling your body to more efficiently process this fuel).
- Increased mitochondrial ATP production (helping your muscle to generate power from this new energy derived from fat).

This occurs through an ingredient called epigallocatechin-3-gallate (EGCG), which gets converted into gallic acid (GA) in the gut.⁴ GA has been shown to stimulate a receptor present in metabolically-active tissues (those using large amounts of energy such as muscle tissue) called GPRG6A, which has a number of beneficial effects that have been suggested to enhance athletic and cognitive performance.⁴ Taking 1-10 servings of MISSION daily has been shown to be within the optimal amount according to studies.¹⁻³



References:

1. Unno, K. et al. Stress-Reducing Function of Matcha Green Tea in Animal Experiments and Clinical Trials. *Nutrients* 10, (2018).
2. White, D. J. et al. Anti-Stress, Behavioural and Magnetoencephalography Effects of an l-Theanine-Based Nutrient Drink: A Randomised, Double-Blind, Placebo-Controlled, Crossover Trial. *Nutrients* 8, 53 (2016).
3. Gilbert, N. The science of tea's mood-altering magic. *Nature* 566, S8-S9 (2019).
4. Pi, M. et al. GPCR6A Is a Molecular Target for the Natural Products Gallate and EGCG in Green Tea. *Mol. Nutr. Food Res.* 62, 1700770 (2018).
5. Jówko, E., Długołęcka, B., Makaruk, B. & Cieśliński, I. The effect of Green Tea extract 19 supplementation on exercise-induced oxidative stress parameters in male sprinters. *Eur. J. Nutr.* 54, 783-791 (2015).
6. Tsai, T.-W. et al. Effect of green tea extract supplementation on glycogen replenishment in exercised human skeletal muscle. *Br. J. Nutr.* 117, 1343-1350 (2017).



Guarana has the highest caffeine concentration reported in plants, with other compounds such as theobromine (see Cocoa) and theophylline present in smaller amounts.¹ For this reason it has been the subject of investigation for its potential performance enhancing benefits, which are thought to be:^{2,3}

- Improved cognitive performance:
 - Improved decision-making and mental alertness
 - Improved memory;
- Reduced perceived exhaustion after submaximal exercise.

HOW DOES GUARANA AFFECT COGNITIVE PERFORMANCE?

Of the studies assessing the independent effect of Guarana on cognitive performance, one found that Guarana doses of 37.5mg, 75mg, 150mg and 300mg all resulted in improved memory and subjective alertness compared with a placebo.⁴ Interestingly, they also found that the lower doses of Guarana (37.5mg and 75mg) produced more positive results than the higher doses, yet at these more effective doses Guarana contains relatively little caffeine (± 9 mg of caffeine in 75mg of Guarana) suggesting that the beneficial effects of Guarana on cognitive performance were not solely due to the stimulatory effects of caffeine.⁴

Overall the exact mechanism behind these beneficial effects on mental alertness, memory and perceived exhaustion are not known, while the effects of guarana on sport-specific performance are also unknown.⁴ Nevertheless these benefits are clear.

References:

1. Schimpl, F. C. et al. Molecular and biochemical characterization of caffeine synthase and purine alkaloid concentration in guarana fruit. *Phytochemistry* 105, 25–36 (2014).
2. Schimpl, F. C., da Silva, J. F., Gonçalves, J. F. de C. & Mazzafera, P. Guarana: Revisiting a highly caffeinated plant from the Amazon. *J. Ethnopharmacol.* 150, 14–31 (2013).
3. Pomportes, L., Brisswalter, J., Casini, L., Hays, A. & Davranche, K. Cognitive Performance Enhancement Induced by Caffeine, Carbohydrate and Guarana Mouth Rinsing during Submaximal Exercise. *Nutrients* 9, (2017).
4. Baker, L. B., Nuccio, R. P. & Jeukendrup, A. E. Acute effects of dietary constituents on motor skill and cognitive performance in athletes. *Nutr. Rev.* 72, 790–802 (2014).

² Studies looking at the effect of Guarana supplementation on exercise performance often use Guarana in combination with other vitamins and minerals.³ For this reason, there are few studies that have looked specifically at the effects of Guarana alone.^{1,4}



By promoting metabolic flexibility, Ginger helps to ensure a sustained supply of energy to ensure you are able to think clearly throughout the day and avoid the mental slump that comes with a crash.¹⁻⁴

HOW DOES GINGER WORK TO IMPROVE METABOLIC FLEXIBILITY?

Ginger influences a key pathway in the concept of metabolic flexibility which is regulated by something called PPAR δ (see Breaking The Wall); PPAR δ is present in highly-active tissues such as skeletal muscle, and it functions to regulate the use of energy in these tissues, helping to switch these muscle of being dependent on carbohydrates for energy to being more dependent on fats.^{2,4} By increasing fat metabolism in skeletal muscles, Ginger extract supplementation has been shown to improve exercise endurance capacity and reduce

diet-induced obesity.² This, in combination with reports that Ginger enhances testosterone during exercise production suggests that Ginger has the potential to provide significant ergogenic benefits for athletes and other high performers. ³

In this regard, Ginger taken regularly provides sustained energy to keep you focused throughout the day.

References:

1. Wilson, P. B. Ginger (*Zingiber officinale*) as an analgesic and ergogenic aid in sport: a systemic review. *J. Strength Cond Res* 29 , 2980-2995 (2015).
2. Misawa, K. et al. Ginger extract prevents high-fat diet-induced obesity in mice via activation of the peroxisome proliferator-activated receptor δ pathway. *J. Nutr. Biochem.* 26, 1058-1067 (2015).
3. Banihani, S. A. Ginger and Testosterone. *Biomolecules* 8 , (2018).
4. Fan, W. et al. PPAR δ Promotes Running Endurance by Preserving Glucose. *Cell Metab.* 25, 1186-1193.e4 (2017).

BEETROOT



By improving cardiovascular efficiency, Beetroot helps to get more oxygen to your brain so that you can keep focused even when you are in an oxygen deficit, such as during intense exercise. This occurs due to beetroot supplementation resulting in:^{1,2}

- Reduced oxygen consumption;
- Increased time to exhaustion at submaximal intensities;
- Improved performance at anaerobic threshold intensities (meaning that you're able to perform better when your muscles run out of oxygen);
- Improved VO_{2max}

HOW DOES BEETROOT WORK?

More specifically, Beetroot acts as an ergogenic (performance enhancer) by increasing cardiorespiratory efficiency, mainly through increasing the levels of nitric oxide (NO) in your blood.¹ This has a number of health benefits that serve to improve overall athletic performance including:¹

- Increased blood flow to highly active tissues (e.g. skeletal muscle)
- Improved gaseous exchange (allowing more efficient oxygenation of tissues)
- Improved mitochondrial ATP production (more efficient energy generation)
- Stronger muscular contraction

HOW TO TAKE IT?

These performance benefits are generally seen 150mins after beetroot ingestion, with peak NO concentrations achieved within 2-3 hours.²

BEETROOT AT ALTITUDE

Furthermore, Beetroot supplementation has also been suggested to improve performance at altitude (and other low oxygen environments), possibly through reducing the oxygen cost of exercise and improving tissue oxygenation, although further studies will be required to definitively establish this.³ This is especially true with regular Beetroot supplementation (≥ 15 days).¹



References:

1. Domínguez, R. et al. Effects of Beetroot Juice Supplementation on Cardiorespiratory Endurance in Athletes. A Systematic Review. *Nutrients* 9 , (2017).
2. Casazza, G. A., Tovar, A. P., Richardson, C. E., Cortez, A. N. & Davis, B. A. Energy Availability, Macronutrient Intake, and Nutritional Supplementation for Improving Exercise Performance in Endurance Athletes: *Curr. Sports Med. Rep.* 17 , 215-223 (2018).
3. Shannon, O. M. et al. 'Beet-ing' the Mountain: A Review of the Physiological and Performance Effects of Dietary Nitrate Supplementation at Simulated and Terrestrial Altitude. *Sports Med Auckl. NZ* 47 , 2155-2169 (2017).



By reducing inflammation, cardamom helps to avoid any damage which would affect your ability to focus.¹⁻³

HOW DOES CARDAMOM WORK?

Cardamom contains relatively high quantities of polyphenols, flavonoids and other compounds that act to inhibit the production of proinflammatory molecules (called cytokines) which accumulate in highly active and/or stressed tissues (e.g. skeletal muscles during exercise) and lead to damage which results in inflammation and increases the recovery time of that tissue.³ By inhibiting these molecules as well as a molecule called hydrogen peroxide (a potent generator of harmful oxygen free radicals which causes further inflammatory damage), cardamom protects these highly active tissues.

References:

1. Kazemi, S. et al. Cardamom supplementation improves inflammatory and oxidative stress biomarkers in hyperlipidemic, overweight, and obese pre-diabetic women: a randomized double-blind clinical trial. *J. Sci. Food Agric.* 97, 5296-5301 (2017).
2. Nagashree, S., Archana, K. K., Srinivas, P., Srinivasan, K. & Sowbhagya, H. B. Anti-hypercholesterolemic influence of the spice cardamom (*Elettaria cardamomum*) in experimental rats. *J. Sci. Food Agric.* 97, 3204-3210 (2017).
3. Kandikattu, H. K. et al. Anti-inflammatory and anti-oxidant effects of Cardamom (*Elettaria repens* (Sonn.) Baill) and its phytochemical analysis by 4D GCXGC TOF-MS. *Biomed. Pharmacother.* 91, 191-201 (2017).



PERFORM

This blend is designed for sustained athletic performance and as a replacement to high sugar, high caffeine energy drinks or coffee. It does this in two ways. Firstly, it promotes sustained energy by using ingredients such as Green Tea, Yerba Maté, and Siberian Ginseng to enhance metabolic flexibility and switch your muscles to rely more on fat for energy production instead of carbohydrates. Secondly, ingredients such as Spearmint and Gotu Kola enhance cognitive performance, specifically by improving reactive agility and mental acuity. Yerba Maté in particular helps to improve athletic performance at submaximal intensity, meaning that it improves your endurance over a long period of time.

INGREDIENTS (per 2.5g loose leaf serving):

Chinese Sencha Green Tea (54%), Yerba Maté (12%), Spearmint (10%), Siberian Ginseng, Schizandra berries, Gotu Kola, Lemongrass, natural flavouring. Protein, Rice Protein, Ginger, Beetroot, Green Cardamom, natural flavouring.

FUNCTIONS OF SELECTED INGREDIENTS:

YERBA MATÉ

Promotes metabolic flexibility (using fats instead of carbs) and improves cognitive performance.

GREEN TEA

Promotes metabolic flexibility (using fats instead of carbs) and reduces harmful inflammation.

SPEARMINT

Improves reactive agility by enhancing mental acuity.

SIBERIAN GINSENG

Possibly helps to boost energy and promote metabolic flexibility.

GOTU KOLA

Enhances cognitive performance and reduces harmful inflammation.

| TYPICAL VALUES | PER 100G |
|---------------------------|-------------------|
| Energy | 1357kj 324kcal |
| Fat of which saturates | 4g 0.7g |
| Fat of which sugars | 33g 4.4g |
| Fibre | 17g |
| Protein | 33g |
| Salt | 0.39g |

Table 5: Nutritional information for Perform (contains 14mg caffeine).



Yerba Maté helps you to avoid energy crashes by improving metabolic flexibility to ensure a sustained supply of energy, as well as containing high amounts of theobromine which helps to ensure that you remain focused for long periods of time, helping to improve your overall performance in long endurance events. It has also been shown to act as a pain reliever and enhances cognition.¹⁻³

HOW DOES YERBA MATÉ AFFECT PERFORMANCE?

The primary effect of interest of Yerba Maté is its ability to enhance metabolic flexibility, meaning that it allows your body to switch easily between different forms of fuel to generate energy.³ This is important when it comes to athletic performance, as optimising the way your body uses its available fuel means you can go longer without having to consume more.¹⁻³ With regard to fat metabolism, this is the process of breaking down fat and using it to generate ATP (the basic molecular form of energy used by muscle cells).^{2,3} Yerba Maté has been shown to increase your body's levels of fat metabolism at low exercise intensities (30-50% of VO₂max), whereas this usually only occurs when your body has run out of available carbohydrates which are much easier to break down and quickly turn into available energy.^{2,3} This means that Yerba Maté allows your body to reserve its available carbohydrate stores for use in bouts of high-intensity exercise, which can often be the key points in determining how you performance overall in an endurance race.^{2,3} In doing so, Yerba Maté helps you to avoid energy crashes during a race and keeps you performing better for longer.

WHAT OTHER EFFECTS DOES YERBA MATÉ HAVE?

Yerba Maté has been shown to improve performance over and above that which can be explained by fat metabolism.^{2,3} It is known to act as a brain stimulant (it contains high amounts of caffeine and theobromine - see Introduction and Cocoa) as well as having analgesic (pain relieving) and anxiolytic (anxiety reducing) effects, all of which could potentially explain this effect. However, the exact mechanisms as to why this occurs are still unknown.^{2,3}

References:

1. Heck, C. I. & Mejia, E. G. D. Yerba Maté Tea (*Ilex paraguariensis*): A Comprehensive Review on Chemistry, Health Implications, and Technological Considerations. *J. Food Sci.* 72, R138-R151 (2007).
2. Alkhatib, A. Yerba Maté (*Illex Paraguariensis*) ingestion augments fat oxidation and energy expenditure during exercise at various submaximal intensities. *Nutr. Metab.* 11, 42 (2014).
3. Areta, J., et al. Metabolic and Performance Effects of Yerba Maté on Well-trained Cyclists. *Med. Sci. Sports Exerc.* 50, 817-826 (2018).

CHINESE SENCHA GREEN TEA



Green Tea, containing high amounts of EGCG and antioxidants is an ideal base for MISSION's Perform Tea . EGCG helps to ensure metabolic flexibility thereby providing a sustained supply of energy whilst antioxidants reduce harmful inflammation helping your muscles to keep performing at their peak capacity. These conditions together result in overall improvements in athletic performance.¹⁻⁴

HOW DOES EGCG IN GREEN TEA GENERATE NEW ENERGY?

The main benefit of Green Tea in generating new energy is from improved metabolic flexibility, through:¹⁻³

- Improved fat metabolism (allowing your body to derive more fuel from fat instead of carbohydrates).
- Improved glucose tolerance, insulin secretion and sensitivity (enabling your body to more efficiently process this fuel).
- Increased mitochondrial ATP production (helping your muscle to generate power from this new energy derived from fat).

This occurs through an ingredient called epigallocatechin-3-gallate (EGCG), which gets converted into gallic acid (GA) in the gut. GA has been shown to stimulate a receptor present in metabolically-active tissues (those using large amounts of energy such as muscle tissue) called GPRG6A, which has a number of beneficial effects that have been suggested to enhance athletic and cognitive performance.¹

GETTING THE RIGHT AMOUNT OF EGCG.

However, this and other studies have noted that there is a high degree of variability in metabolic response (how efficiently your body uses energy) seen with Green Tea supplementation, and dosage is thought to be a key factor in this by helping to achieve the correct GA to EGCG ratio.¹⁻³ GA stimulates the receptor GPRG6A while EGCG inhibits it, therefore providing enough EGCG to be converted into GA but not too much that it will inhibit GPRG6A is crucial in order to see the benefits of green tea supplementation.

HOW DOES GREEN TEA PREVENT CELL DAMAGE?

Green Tea helps to prevent cell damage by reducing harmful inflammation, through:¹⁻³

- Inhibiting inflammatory cytokine production (meaning a faster recovery with less muscle damage).

The mechanism behind these benefits has to do with the process of oxidative stress.^{1,2}



When a tissue is working hard, cells generate harmful molecules called reactive oxygen species (ROS) as a by-product, which are then usually mopped up by antioxidants.²

When the generation of ROS exceeds the physiological capacity of the antioxidant system to render them inert, damage occurs.² Tea catechins and polyphenols are known to have significant antioxidant properties, and in one study Green Tea extract given as a supplement over 4-weeks to weight-trained athletes increased blood antioxidant levels and reduced markers of oxidative damage in both acute high-intensity and long-term muscular endurance tests.²

A follow-up study found that two 250 mg Green Tea extract supplements (each containing 137 mg of EGCG), given twice daily (total Green Tea dose 1g) to individuals undergoing high-intensity sprint training, improved antioxidant levels, attenuated oxidative damage during the recovery period, and preserved the training-induced adaptive response to oxidative stress known to increase antioxidant enzyme gene expression.² Taking 1-10 servings of MISSION daily has been shown to be within the optimal amount according to studies.¹⁻³

References:

1. Pi, M. et al. GPCR6A Is a Molecular Target for the Natural Products Gallate and EGCG in Green Tea. *Mol. Nutr. Food Res.* 62, 1700770 (2018).
2. Jówko, E., Długołęcka, B., Makaruk, B. & Cieśliński, I. The effect of Green Tea extract supplementation on exercise-induced oxidative stress parameters in male sprinters. *Eur. J. Nutr.* 54, 783-791 (2015).
3. Tsai, T.-W. et al. Effect of green tea extract supplementation on glycogen replenishment in exercised human skeletal muscle. *Br. J. Nutr.* 117, 1343-1350 (2017).
4. Gilbert, N. The science of tea's mood-altering magic. *Nature* 566, S8-S9 (2019).



Rosmarinic acid is one of the active compounds found in a variety of herbal plants including Spearmint (*Mentha spicata*), and as far as its potential to enhance athletic performance is concerned, the main benefit of Spearmint is its nootropic properties (ability to enhance cognition), more specifically its ability to improve reactive agility.¹⁻³

WHAT IS REACTIVE AGILITY AND HOW DOES SPEARMINT IMPROVE IT?

Reactive agility is defined as any unplanned change in direction or speed, and has been shown to translate into improved athletic performance.² Interestingly, improvements in reactive agility have been more closely linked with cognitive aspects such as response- and decision-making time than with physical aspects such as sprint speed or change-of-direction speed.² This means that compounds that have nootropic (cognitive enhancing) properties could potentially improve athletic performance by enhancing reactive agility, which is what one study found when they provided a group of young, healthy, and recreationally-active participants with Spearmint extract daily for 90 days.²

References:

1. Lasrado, J. A. et al. Safety and tolerability of a dried aqueous Spearmint extract. *Regul. Toxicol. Pharmacol.* RTP 86, 167-176 (2017).
2. Falcone, P. H. et al. Efficacy of a nootropic Spearmint extract on reactive agility: a randomized, double-blind, placebo-controlled, parallel trial. *J. Int. Soc. Sports Nutr.* 15, 58 (2018).
3. Pearson, W., Fletcher, R. S., Kott, L. S. & Hurtig, M. B. Protection against LPS-induced cartilage inflammation and degradation provided by a biological extract of *Mentha spicata*. *BMC Complement. Altern. Med.* 10, 19 (2010).

SIBERIAN GINSENG



Siberian Ginseng (*Eleutherococcus senticosus*) is a species of plant that is distantly related to the three main types of ginseng (colloquially known as Chinese/Korean, Japanese, and American varieties) and has been traditionally used for its reported benefits, which include: ¹⁻⁴

- Acting as an energy booster, significantly prolonging endurance capacity.
- More efficient metabolic flexibility, specifically:
 - Helping to free up fat for energy generation whilst maintaining consistent blood glucose levels (meaning more consistent energy levels during exercise).

HOW DOES GINSENG INCREASE ENDURANCE CAPACITY?

Ginseng plants are known to contain compounds called saponins, specifically it has been found that certain saponins such as ginsenosides Rg 1 and Rb 1 are key to the ability of Ginseng to enhance endurance capacity.² Siberian Ginseng contains a different set of compounds called eleutherosides, which so far have shown mixed results in their ability to mimic the performance enhancing capacity of other ginseng types.^{1,3}

In this regard, one recent study showed that supplementation with 800 mg/day of Siberian Ginseng for 8-weeks resulted in enhanced $\dot{V}O_{2max}$ in recreationally-trained cyclists, recapitulating some of the benefits reported in the original Soviet studies.^{3,4} The studies seem to suggest that any possible benefits of Siberian Ginseng on athletic performance would only be significant after long-term supplementation (>8-weeks).^{2,3}

References:

1. Arouca, A. & Grassi-Kassisse, D. M. *Eleutherococcus senticosus*: Studies and effects. *Health (N. Y.)* 05, 1509-1515 (2013).
2. Bahrke, M. S. & Morgan, W. P. Evaluation of the Ergogenic Properties of Ginseng. *Sports Med.* 29, 113-133 (2000).
3. Bucci, L. R. Selected herbals and human exercise performance. *Am. J. Clin. Nutr.* 72, 624S-636S (2000).
4. Kuo, J. The Effect of Eight Weeks of Supplementation with *Eleutherococcus senticosus* on Endurance Capacity and Metabolism in Human. *Chin. J. Physiol.* 53, 105-111 (2010).



Gotu Kola (*Centella asiatica*) is used in traditional Chinese and Ayurvedic medicine to reverse cognitive impairment (in diseases such as dementia), but as far as athletic performance is concerned it has the following potential benefits: ¹⁻³

- Enhanced cognitive performance (heightened mental acuity is correlated with better athletic performance), specifically:
 - Improved spatial memory (making you more aware of your surrounding environment).
 - Better planning and decision-making (improving reactive agility - the ability to react to unexpected changes in direction or speed).
 - Greater cognitive flexibility (making it easier to switch between tasks more quickly).
- Antioxidant properties (helping to reduce tissue damage and speed up recovery).

HOW DOES GOTU KOLA ACT AS A NOOTROPIC?

The cognitive benefits of Gotu Kola have been well-documented and seem to be related to its ability to reduce the levels of harmful A β -molecules that are thought to be responsible for causing Alzheimer's Disease.¹ However, not all these benefits can be explained by this and the mechanisms behind remain to be fully elucidated.¹

THE ANTIOXIDANT BENEFITS OF GOTU KOLA

The ability of Gotu Kola to act as an antioxidant by reducing inflammation and thereby minimising tissue damage might also explain some of these cognitive benefits, as well as its potential to assist in speeding up recovery post-exercise.^{1,3,4}

References:

1. Gray, N. E. et al. *Centella asiatica* attenuates hippocampal mitochondrial dysfunction and improves memory and executive function in β -amyloid overexpressing mice. *Mol. Cell. Neurosci.* 93, 1-9 (2018).
2. Falcone, P. H. et al. Efficacy of a nootropic spearmint extract on reactive agility: a randomized, double-blind, placebo-controlled, parallel trial. *J. Int. Soc. Sports Nutr.* 15, 58 (2018).
3. Pittella, F., Dutra, R. C., Junior, D. D., Lopes, M. T. P. & Barbosa, N. R. Antioxidant and Cytotoxic Activities of *Centella asiatica* (L) Urb. *Int. J. Mol. Sci.* 10, 3713-3721 (2009).
4. Rababah, T. M., Hettiarachchy, N. S. & Horax, R. Total Phenolics and Antioxidant Activities of Fenugreek, Green Tea, Black Tea, Grape Seed, Ginger, Rosemary, Gotu Kola, and Ginkgo Extracts, Vitamin E, and tert-Butylhydroquinone. *J. Agric. Food Chem.* 52, 5183-5186 (2004).



MISSION

ENDURE

For sustained endurance performance, Endure is the perfect replacement to a high sugar, high caffeine energy drink or coffee. This blend is designed to improve your endurance capacity. The main ingredients in this regard are Matcha Green Tea, Yerba Maté, Maca, and Siberian Ginseng which help to enhance metabolic flexibility by switching your muscles to rely more on fat for energy production instead of carbohydrates. The inclusion of Baobab and Liquorice means that this tea also helps to reduce harmful inflammation, helping to keep your muscles performing at their peak, as well as boosting your immune system to prevent long endurance events from wearing you down. Yerba Maté and Maca in particular help to improve endurance capacity, meaning improved overall athletic performance.

INGREDIENTS (per 1g serving of Matcha powder):

Organic Ceremonial Grade Japanese Matcha Green tea (36%), Yerba Maté (12%), Baobab, Cinnamon, Maca, natural flavouring, Pea Protein, Liquorice, Siberian Ginseng, Orange Peel.

FUNCTIONS OF SELECTED INGREDIENTS:

MATCHA GREEN TEA

Improves focus and promotes metabolic flexibility.

YERBA MATÉ

Promotes metabolic flexibility (using fats instead of carbs) and improves cognitive performance.

BAOBAB

Reduces harmful inflammation and strengthens your immune system.

MACA

Improves endurance capacity and reduces harmful inflammation.

LIQUORICE

Reduces harmful inflammation and protects against infection.

SIBERIAN GINSENG

Possibly helps to boost energy and promote metabolic flexibility.

| TYPICAL VALUES | PER 100G |
|---------------------------|-------------------|
| Energy | 1237kj 296kcal |
| Fat of which saturates | 2.4g 0.8g |
| Fat of which sugars | 41g 8.4g |
| Fibre | 27g |
| Protein | 17g |
| Salt | 0.27g |

Table 6: Nutritional information for Endure (contains 12mg caffeine).

ORGANIC MATCHA GREEN TEA



The benefits of Matcha Green Tea on improving focus centre around its high content of L-theanine and of EGCG.¹⁻³

WHAT IS MATCHA AND HOW DOES L-THEANINE HELP FOCUS?

Matcha is a version of Green Tea that is prepared by protecting tea leaves from direct sunlight, and then grinding up the entire leaf into a fine powder.¹ This results in Matcha being the best-grade Green Tea, having especially high amounts of L-theanine compared to normally prepared Green Tea.^{1,2}

L-theanine is an amino-acid found in high concentrations in Green Tea, and especially matcha.¹⁻³ It has a number of reported benefits but most attention has been paid to its ability to reduce stress and anxiety whilst simultaneously improving awareness. 1-3 L-theanine essentially helps to put you in the zone, removing any distractions and focusing your attention on what's important.¹⁻³

HOW DOES EGCG IN GREEN TEA GENERATE NEW ENERGY?

The main benefit of Green Tea in generating new energy is from improved metabolic flexibility, through:⁴⁻⁶

- Improved fat metabolism (allowing your body to derive more fuel from fat instead of carbohydrates).
- Improved glucose tolerance, insulin secretion and sensitivity (enabling your body to more efficiently process this fuel).
- Increased mitochondrial ATP production (helping your muscle to generate power from this new energy derived from fat).

This occurs through an ingredient called epigallocatechin-3-gallate (EGCG), which gets converted into gallic acid (GA) in the gut.⁴ GA has been shown to stimulate a receptor present in metabolically-active tissues (those using large amounts of energy such as muscle tissue) called GPRG6A, which has a number of beneficial effects that have been suggested to enhance athletic and cognitive performance.⁴ Taking 1-10 servings of MISSION daily has been shown to be within the optimal amount according to studies.¹⁻³



References:

1. Unno, K. et al. Stress-Reducing Function of Matcha Green Tea in Animal Experiments and Clinical Trials. *Nutrients* 10, (2018).
2. White, D. J. et al. Anti-Stress, Behavioural and Magnetoencephalography Effects of an l-Theanine-Based Nutrient Drink: A Randomised, Double-Blind, Placebo-Controlled, Crossover Trial. *Nutrients* 8, 53 (2016).
3. Gilbert, N. The science of tea's mood-altering magic. *Nature* 566, S8-S9 (2019).
4. Pi, M. et al. GPCR6A Is a Molecular Target for the Natural Products Gallate and EGCG in Green Tea. *Mol. Nutr. Food Res.* 62, 1700770 (2018).
5. Jówko, E., Długołęcka, B., Makaruk, B. & Cieśliński, I. The effect of Green Tea extract 19 supplementation on exercise-induced oxidative stress parameters in male sprinters. *Eur. J. Nutr.* 54, 783-791 (2015).
6. Tsai, T.-W. et al. Effect of green tea extract supplementation on glycogen replenishment in exercised human skeletal muscle. *Br. J. Nutr.* 117, 1343-1350 (2017).



Yerba Maté helps you to avoid energy crashes by improving metabolic flexibility to ensure a sustained supply of energy, as well as containing high amounts of theobromine which helps to ensure that you remain focused for long periods of time, helping to improve your overall performance in long endurance events. It has also been shown to act as a pain reliever and enhances cognition.¹⁻³

HOW DOES YERBA MATÉ AFFECT PERFORMANCE?

The primary effect of interest of Yerba Maté is its ability to enhance metabolic flexibility, meaning that it allows your body to switch easily between different forms of fuel to generate energy.³ This is important when it comes to athletic performance, as optimising the way your body uses its available fuel means you can go longer without having to consume more.¹⁻³ With regard to fat metabolism, this is the process of breaking down fat and using it to generate ATP (the basic molecular form of energy used by muscle cells).^{2,3} Yerba Maté has been shown to increase your body's levels of fat metabolism at low exercise intensities (30-50% of VO₂max), whereas this usually only occurs when your body has run out of available carbohydrates which are much easier to break down and quickly turn into available energy.^{2,3} This means that Yerba Maté allows your body to reserve its available carbohydrate stores for use in bouts of high-intensity exercise, which can often be the key points in determining how you performance overall in an endurance race.^{2,3} In doing so, Yerba Maté helps you to avoid energy crashes during a race and keeps you performing better for longer.

WHAT OTHER EFFECTS DOES YERBA MATÉ HAVE?

Yerba Maté has been shown to improve performance over and above that which can be explained by fat metabolism.^{2,3} It is known to act as a brain stimulant (it contains high amounts of caffeine and theobromine - see Introduction and Cocoa) as well as having analgesic (pain relieving) and anxiolytic (anxiety reducing) effects, all of which could potentially explain this effect. However, the exact mechanisms as to why this occurs are still unknown.^{2,3}

References:

1. Heck, C. I. & Mejia, E. G. D. Yerba Maté Tea (*Ilex paraguariensis*): A Comprehensive Review on Chemistry, Health Implications, and Technological Considerations. *J. Food Sci.* 72, R138-R151 (2007).
2. Alkhatib, A. Yerba Maté (*Illex Paraguariensis*) ingestion augments fat oxidation and energy expenditure during exercise at various submaximal intensities. *Nutr. Metab.* 11, 42 (2014).
3. Areta, J., et al. Metabolic and Performance Effects of Yerba Maté on Well-trained Cyclists. *Med. Sci. Sports Exerc.* 50, 817-826 (2018).



The Baobab is a tree found in sub-Saharan Africa which recent studies have shown has potential benefits for enhancing athletic performance, including: ¹⁻³

- Anti-inflammatory properties (through increasing antioxidant activity thereby reducing harmful inflammation and improving recovery time).
- Immunomodulatory properties (meaning that it strengthens your immune system).

HOW DOES BAOBAB REDUCE INFLAMMATION?

Baobab fruit pulp extract has a high polyphenol content, which are compounds known to exhibit significant antioxidant properties. ¹⁻³ This means that these polyphenols are able to inhibit the effects of certain molecules which accumulate in highly active tissues (e.g. skeletal muscles during exercise) and lead to inflammatory damage. ¹⁻³ By preventing this, Baobab reduces the recovery time of these tissues, meaning you can get back to training more quickly.

HOW DOES BAOBAB IMPROVE IMMUNITY?

As far as your immune system is concerned, Baobab fruit is known to contain high levels of vitamin-C (>100mg vitamin-C per 100g of Baobab; compared to ±53 mg/100g for Oranges). This benefits the immune system of those undergoing intense physical exercise by reducing the severity and duration of symptoms of the common cold. ^{1,2,4,5}

References:

1. Braca, A. et al. Phytochemical Profile, Antioxidant and Antidiabetic Activities of *Adansonia digitata* L. (Baobab) from Mali, as a Source of Health-Promoting Compounds. *Mol. Basel Switz.* 23, (2018).
2. Kinghorn, A. D., Chai, H., Sung, C. K. & Keller, W. J. The classical drug discovery approach to defining bioactive constituents of botanicals. *Fitoterapia* 82 , 71-79 (2011).
3. Coe, S. A., Clegg, M., Armengol, M. & Ryan, L. The polyphenol-rich Baobab fruit (*Adansonia digitata* L.) reduces starch digestion and glycemic response in humans. *Nutr. Res.* 33, 888-896 (2013).
4. Douglas, R. M., Hemilä, H., Chalker, E. & Treacy, B. Vitamin C for preventing and treating the common cold. *Cochrane Database Syst. Rev.* CD000980 (2007). doi:10.1002/14651858.CD000980.pub3
5. FoodData Central. Available at: <https://fdc.nal.usda.gov/fdc-app.html#/food-details/169097/nutrients>. (Accessed: 19th August 2019)



Maca (or *Lepidium meyenii* Walp.) is a plant native to the Peruvian Andes that has been used to improve endurance.¹ In this regard, one clinical trial has shown that Maca extract (ME) supplementation significantly improved cycling time-trial performance, with a number of subsequent animal studies showing that ME improves markers of endurance capacity through:¹⁻³

- Reducing harmful metabolic by-products such as lactic acid and ammonia (meaning more time until your muscles fatigue).
- Enhancing the activities of antioxidants (meaning that harmful reactive oxygen species cause less inflammatory damage, reducing your time to recovery).

HOW DOES MACA IMPROVE ENDURANCE CAPACITY?

On a tissue level, the build-up of metabolic by-products, including lactic acid and ammonia, as well as that of oxygen free radicals (which go on to cause inflammatory damage, increasing time to recovery) both contribute to the physical fatigue of skeletal muscle.^{2,3} Physical fatigue negatively impacts endurance capacity, so by helping to minimise the effects of both these contributing factors, Maca can boost overall performance in endurance and strength-based exercise.¹⁻³

References:

1. Stone, M., Ibarra, A., Roller, M., Zangara, A. & Stevenson, E. A pilot investigation into the effect of Maca supplementation on physical activity and sexual desire in sportsmen. *J. Ethnopharmacol.* 126, 574-576 (2009).
2. Wang, S. & Zhu, F. Chemical composition and health effects of Maca (*Lepidium meyenii*). *Food Chem.* 288, 422-443 (2019).
3. Yang, Q. et al. Effects of macamides on endurance capacity and anti-fatigue property in prolonged swimming mice. *Pharm. Biol.* 54, 827-834 (2016).

LIQUORICE



Liquorice helps to reduce harmful inflammation to keep your muscles performing at their peak in long endurance events, as well as boosting your immune system to help prevent any negative effects of strenuous exercise on your ability to fight infections.¹⁻³

LIQUORICE AS AN ANTI-INFLAMMATORY.

Liquorice contains certain compounds called triterpenoids and flavonoids which inhibit proinflammatory molecules (COX, cytokines, oxygen free-radicals and others) which prevents harmful inflammation.^{2,3} It also acts to change the way cellular DNA is expressed, meaning that your cells read DNA in a way that reduces the number of receptors these harmful inflammatory molecules can bind to on the cell surface.^{2,3} This means that Liquorice helps to reduce your recovery time, getting you back to training faster.

LIQUORICE AS AN ANTIMICROBIAL.

Liquorice also helps to prevent infection by harmful microorganisms (microbes), acting against both viruses and bacteria.^{1,2} By inhibiting the replication and release of viral particles, suppressing the ability of viruses to interact with cells in your body and through activating the immune system, Liquorice helps to act against many viruses, including those responsible for causing the flu and the common cold.^{1,2} Liquorice also helps to act against bacteria by inhibiting their ability to replicate in your body as well as reducing their ability to release harmful toxins.^{1,2} In this way, Liquorice helps to minimise the number of sick days that could potentially derail your training plans.

It is possible to get too much of a good thing though. In large amounts and with long-term use, Liquorice can be toxic. However, the amount of Liquorice in Energise means that you can enjoy the benefits stress-free.²

References:

1. Wang, L., Yang, R., Yuan, B., Liu, Y. & Liu, C. The antiviral and antimicrobial activities of licorice, a widely-used Chinese herb. *Acta Pharm. Sin.* B5, 310-315 (2015).
2. Yang, R., Wang, L., Yuan, B. & Liu, Y. The Pharmacological Activities of Licorice. *Planta Med.* 81, 1654-1669 (2015).
3. Yang, R., Yuan, B.-C., Ma, Y.-S., Zhou, S. & Liu, Y. The anti-inflammatory activity of licorice, a widely used Chinese herb. *Pharm. Biol.* 55, 5-18 (2017).

SIBERIAN GINSENG



Siberian Ginseng (*Eleutherococcus senticosus*) is a species of plant that is distantly related to the three main types of ginseng (colloquially known as Chinese/Korean, Japanese, and American varieties) and has been traditionally used for its reported benefits, which include: ¹⁻⁴

- Acting as an energy booster, significantly prolonging endurance capacity.
- More efficient metabolic flexibility, specifically:
 - Helping to free up fat for energy generation whilst maintaining consistent blood glucose levels (meaning more consistent energy levels during exercise).

HOW DOES GINSENG INCREASE ENDURANCE CAPACITY?

Ginseng plants are known to contain compounds called saponins, specifically it has been found that certain saponins such as ginsenosides Rg 1 and Rb 1 are key to the ability of Ginseng to enhance endurance capacity.² Siberian Ginseng contains a different set of compounds called eleutherosides, which so far have shown mixed results in their ability to mimic the performance enhancing capacity of other ginseng types.^{1,3}

In this regard, one recent study showed that supplementation with 800 mg/day of Siberian Ginseng for 8-weeks resulted in enhanced $\dot{V}O_{2max}$ in recreationally-trained cyclists, recapitulating some of the benefits reported in the original Soviet studies.^{3,4} The studies seem to suggest that any possible benefits of Siberian Ginseng on athletic performance would only be significant after long-term supplementation (>8-weeks).^{2,3}

References:

1. Arouca, A. & Grassi-Kassisse, D. M. *Eleutherococcus senticosus*: Studies and effects. *Health (N. Y.)* 05, 1509-1515 (2013).
2. Bahrke, M. S. & Morgan, W. P. Evaluation of the Ergogenic Properties of Ginseng. *Sports Med.* 29, 113-133 (2000).
3. Bucci, L. R. Selected herbals and human exercise performance. *Am. J. Clin. Nutr.* 72, 624S-636S (2000).
4. Kuo, J. The Effect of Eight Weeks of Supplementation with *Eleutherococcus senticosus* on Endurance Capacity and Metabolism in Human. *Chin. J. Physiol.* 53, 105-111 (2010).



RECOVER

This blend is primarily designed to reduce harmful inflammation by increasing antioxidant activity in your body, helping to counter the damaging effects of sustained, high-intensity exercise. Tulsi and Ginkgo Biloba both function in this regard as well as Ashwagandha, which has the added benefit of also improving muscle growth to specifically target skeletal muscle recovery. The inclusion of Lavender helps to promote calm and reduce anxiety, and the basis of this tea is Rooibos - naturally caffeine-free, as well as having its own stress-reducing and anti-inflammatory effects. Recover allows you to derive the pro-recovery benefits of these teas throughout the day as well as just before sleep.

INGREDIENTS (per 2.5g loose leaf serving):

South African Rooibos (53%), Hibiscus, Apple Pieces, Rosehip, Ashwagandha, Tulsi, Strawberry, Ginkgo Biloba, Blackcurrant, Valerian, Lavender, natural flavouring.

FUNCTIONS OF SELECTED INGREDIENTS:

ROOIBOS TEA

Reduces harmful inflammation and lowers stress-hormone levels.

ASHWAGANDHA

Improves muscle growth and reduces harmful inflammation.

TULSI

Reduces stress-hormone levels and improves cognitive function.

GINKGO BILOBA

Increases antioxidant activity and reduces harmful inflammation.

LAVENDER

Anti-anxiety and calming effects.

| TYPICAL VALUES | PER 100ML |
|---------------------------|----------------|
| Energy | 1kj 0kcal |
| Fat of which saturates | <0.5g <0.1g |
| Fat of which sugars | <0.5g <0.5g |
| Fibre | <0.5g |
| Protein | <0.5g |
| Salt | <0.01g |

Table 7: Nutritional information for Recover (caffeine free).



Aspalathus linearis is a South African plant commonly known as Rooibos (“red bush” in Afrikaans), which is gaining popularity as a caffeine-free alternative to other teas.^{1,2} Its potential benefits in assisting recovery from athletic performance include:¹⁻³

- Reducing the levels of stress-hormones in your body (which have also been linked to conditions such as diabetes, cardiovascular disease and obesity).
- Reducing harmful inflammation through increasing antioxidant levels.

HOW CAN ROOIBOS BE USED TO MANAGE STRESS-RELATED CONDITIONS?

One of the body’s natural responses to stress is to release hormones, including glucocorticoids, to help you respond quickly to things it perceives as potentially harmful. This is beneficial in the short term, but chronic stress can lead to high levels of these hormones and result in the development of conditions such as heart disease, diabetes, and obesity.^{1,2} Rooibos has been found to inactivate glucocorticoids and reduce glucocorticoid production, which helps to maintain normal glucocorticoid levels and reduce the incidence of stress-related conditions, including potentially reducing stress-related damage from repeated high-intensity exercise.^{1,2}

ROOIBOS AS AN ANTI-INFLAMMATORY.

Rooibos is known to be a potent source of antioxidants, containing relatively large amounts of flavanoids, which help to reduce harmful inflammation by inhibiting pro-inflammatory molecules that accumulate in highly active tissues such as skeletal muscle during intense exercise.^{2,3} In this way, Rooibos can help to limit tissue damage after exercise and hasten your recovery time.

Additionally, the fact that Rooibos is naturally caffeine-free also means that you can benefit from the Rooibos in MISSION’s Recover at any time of the day.

References:

1. Schloms, L. et al. Rooibos influences glucocorticoid levels and steroid ratios in vivo and in vitro: A natural approach in the management of stress and metabolic disorders? *Mol. Nutr. Food Res.* 58, 537-549 (2014).
2. Marnewick, J. L. et al. Effects of Rooibos (*Aspalathus linearis*) on oxidative stress and biochemical parameters in adults at risk for cardiovascular disease. *J. Ethnopharmacol.* 133, 46-52 (2011).
3. McKay, D. L. & Blumberg, J. B. A review of the bioactivity of South African herbal teas: rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia intermedia*). *Phytother. Res.* 21, 1-16 (2007).



Ashwagandha (*Withania somnifera*) is an Indian herb that is part of a family of plants called adaptogens.¹⁻³ Adaptogens are so called because they help your body functionally adapt when it is under intense physical or mental stress by improving your resistance to stress as well as your ability to perform.¹⁻³

HOW DOES ASHWAGANDHA FUNCTION AS AN ADAPTOGEN?

Intense physical exercise, especially over a long period of time such as in endurance events, exerts a large amount of stress on your body.³ In order to manage this stress, your body has to have certain mechanisms in place to help it adapt.

Ashwagandha, as an adaptogen, enhances these mechanisms and helps your body to adapt to stress, therefore assisting recovery through:¹⁻³

- Improving muscle recovery by speeding up muscle growth, relieving pain and reducing lactic acid levels.
- Reducing harmful inflammation (through increasing antioxidant activity which helps to inhibit pro-inflammatory molecules).
- Decreasing levels of stress hormones such as cortisol.

The compounds in Ashwagandha thought to be behind these adaptogenic effects include steroidal lactones such as withanolides, as well as other compounds such as saponins and alkaloids.¹⁻³

HOW TO TAKE IT?

Recent studies have demonstrated these benefits at a wide range of doses over 10 days or more.¹⁻³ This means that regular small doses of Ashwagandha extract from MISSION's Recover Tea could help to speed up your recovery time and significantly improve your athletic performance.

References:

1. Wankhede, S., Langade, D., Joshi, K., Sinha, S. R. & Bhattacharyya, S. Examining the effect of *Withania somnifera* supplementation on muscle strength and recovery: a randomized controlled trial. *J. Int. Soc. Sports Nutr.* 12, 43 (2015).
2. Kour, K. et al. Restoration of stress-induced altered T cell function and corresponding cytokines patterns by Withanolide A. *Int. Immunopharmacol.* 9, 1137-1144 (2009).
3. Ziegenfuss, T. N. et al. Effects of an Aqueous Extract of *Withania somnifera* on Strength Training Adaptations and Recovery: The STAR Trial. *Nutrients* 10, (2018).



Otherwise known as Holy Basil, Tulsi is a plant native to the Indian Subcontinent that has been shown to have possible recovery benefits including: ^{1,2}

- Managing stress through inhibiting stress hormones such as cortisol.
- Improving cognitive function by increasing the levels of acetylcholine in the brain.

TULSI FOR STRESS REDUCTION.

Cortisol is a hormone that is a key part of the stress response in humans, where consistently high levels can be regarded as a sign of chronic stress.¹ This occurs in response to a number of diseases but can also occur after repeated high-intensity exercise.¹ By inhibiting the release of cortisol, Tulsi can help to manage the stress that training exerts on your body, aiding your recovery.¹

TULSI FOR COGNITIVE ENHANCEMENT.

With regard to cognitive performance, animal studies have shown that Tulsi can be used to increase the levels of acetylcholine in the brain, a compound that is known to be reduced in diseases such as dementia, thereby having the potential to improve cognitive performance in young and middle aged individuals.²

References:

1. Richard, E. J. et al. Anti-stress Activity of *Ocimum sanctum*: Possible Effects on Hypothalamic-Pituitary-Adrenal Axis. *Phytother. Res.* 30, 805-814 (2016).
2. Kusindarta, D. L. et al. Ethanolic extract *Ocimum sanctum*. Enhances cognitive ability from young adulthood to middle aged mediated by increasing choline acetyl transferase activity in rat model. *Res. Vet. Sci.* 118, 431-438 (2018).



HOW DOES GINKGO BILOBA ASSIST RECOVERY?

Natural polyphenolic compounds such as flavonoids and terpene lactones found in Ginkgo Biloba have been shown to reduce inflammatory damage owing to their significant antioxidant properties.^{1,2} This reduces recovery time by inhibiting harmful pro-inflammatory molecules that build up after periods of intense exercise, as well as by improving blood flow, helping to deliver nutrients and remove waste products from highly active tissues such as skeletal muscle and the brain.¹⁻³ In this regard, some studies have shown that 6-weeks of supplementation with Ginkgo Biloba extract results in improvements in endurance capacity and blood antioxidant levels.²

In this way, Ginkgo Biloba's powerful antioxidant properties promote recovery after exercise as well as possibly improving overall athletic performance.

References:

1. Zhang, Z., Tong, Y., Zou, J., Chen, P. & Yu, D. Dietary supplement with a combination of *Rhodiola crenulata* and Ginkgo Biloba enhances the endurance performance in healthy volunteers. *Chin. J. Integr. Med.* 15, 177-183 (2009).
2. Sadowska-Krępa, E. et al. Effects of Six-Week Ginkgo Biloba Supplementation on Aerobic Performance, Blood Pro/Antioxidant Balance, and Serum Brain-Derived Neurotrophic Factor in Physically Active Men. *Nutrients* 9, (2017).
3. Bing, Y. & Zhaobao, W. Effects of Ginkgo Biloba extract on free radical metabolism of liver in mice during endurance exercise. *Afr. J. Tradit. Complement. Altern. Med. AJTCAM* 7, 291-295 (2010).

LAVENDER



Lavender (*Lavandula*) oils have a well documented history of use in oral- and aromatherapies for their anti-anxiety (anxiolytic) and calming effects.¹⁻³ Recent studies have now shown that this could also help to relieve some of the symptoms of anxiety and stress, most notably disturbed sleep.¹⁻³

HOW DOES LAVENDER IMPROVE SLEEP?

Lavender has a complex chemical composition but two of its major constituents, linalool and linalyl acetate, are thought to be behind its reported anxiolytic and calming effects.^{2,3} By binding to and inhibiting GABA receptors and presynaptic calcium channels in the brain, lavender induces a relaxed state, which has been shown in some studies to be as effective as certain medications in treating mild anxiety.¹⁻³

By helping you relax and relieving stress, lavender enhances sleep thereby assisting recovery. A major benefit here is that lavender is also non-sedating, meaning that it is less likely to affect your quality of sleep as opposed to other sedating medications.¹⁻³ This means that lavender is likely to leave you more alert and active the next morning.

References:

1. Kasper, S. An orally administered lavandula oil preparation (Silexan) for anxiety disorder and related conditions: an evidence based review. *Int. J. Psychiatry Clin. Pract.* 17, 15-22 (2013).
2. Perry, R., Terry, R., Watson, L. K. & Ernst, E. Is lavender an anxiolytic drug? A systematic review of randomised clinical trials. *Phytomedicine* 19, 825-835 (2012).
3. Woronuk, G., Demissie, Z., Rheault, M. & Mahmoud, S. Biosynthesis and Therapeutic Properties of *Lavandula* Essential Oil Constituents. *Planta Med.* 77, 7-15 (2011).



MISSION

SLEEP

This blend is designed to improve the quality of sleep as an essential element of performance. The basis for this tea is Rooibos, which is naturally caffeine-free and, along with Ginkgo Biloba, helps to reduce the levels of stress-hormones in your body that can disturb sleep. Lavender acts as a sleep aid by reducing anxiety and promoting a calm, relaxed state, with Turmeric and Ginger both helping to relieve pain and reduce inflammation. The combined effects of these ingredients help to ensure a quality night's sleep as the basis for performance enhancement.

INGREDIENTS (per 1g serving of Matcha powder):

South African Rooibos Matcha (30%), Turmeric (38%), Ginger (15%), Hemp Protein, Natural Flavourings, Ginkgo Biloba, Lavender.

FUNCTIONS OF SELECTED INGREDIENTS:

ROOIBOS TEA

Reduces harmful inflammation and lowers stress-hormone levels.

TURMERIC

Anti-inflammatory and pain-relieving properties.

GINGER

Acts as a pain reliever.

GINKGO BILOBA

Increases antioxidant activity and reduces harmful inflammation.

LAVENDER

Anti-anxiety and calming effects.

| TYPICAL VALUES | PER 100G |
|---------------------------|-------------------|
| Energy | 1483kj 354kcal |
| Fat of which saturates | 5.8g 1.1g |
| Fat of which sugars | 66g 2.6g |
| Fibre | 32g |
| Protein | 10g |
| Salt | 0.31g |

Table 8: Nutritional information for Sleep (caffeine free).



The fact that Rooibos reduces stress and is naturally caffeine-free means that it is an ideal sleep aid, helping to calm you down and relieve anxiety by reducing the levels of stress-hormones in your body.¹⁻³

HOW CAN ROOIBOS BE USED TO MANAGE STRESS-RELATED CONDITIONS?

One of the body's natural responses to stress is to release hormones, including glucocorticoids, to help you respond quickly to things it perceives as potentially harmful. This is beneficial in the short term, but chronic stress can lead to high levels of these hormones and result in the development of conditions such as heart disease, diabetes, and obesity.^{1,2} Rooibos has been found to inactivate glucocorticoids and reduce glucocorticoid production, which helps to maintain normal glucocorticoid levels and reduce the incidence of stress-related conditions, including potentially reducing stress-related damage from repeated high-intensity exercise.^{1,2}

This, and the fact that Rooibos is naturally caffeine-free also means that you can benefit from the Rooibos in MISSION's Sleep to maximise your sleep quality, a crucial part of athletic performance.

References:

1. Schloms, L. et al. Rooibos influences glucocorticoid levels and steroid ratios in vivo and in vitro: A natural approach in the management of stress and metabolic disorders? *Mol. Nutr. Food Res.* 58, 537-549 (2014).
2. Marnewick, J. L. et al. Effects of Rooibos (*Aspalathus linearis*) on oxidative stress and biochemical parameters in adults at risk for cardiovascular disease. *J. Ethnopharmacol.* 133, 46-52 (2011).
3. McKay, D. L. & Blumberg, J. B. A review of the bioactivity of South African herbal teas: rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia intermedia*). *Phytother. Res.* 21, 1-16 (2007).

TURMERIC



Turmeric (*Curcuma longa*) is a member of the Ginger family that has been shown to have potential anti-inflammatory and pain-relieving (analgesic) properties. By reducing inflammation and acting as a pain reliever, Turmeric helps to improve sleep quality and enhance recovery after exercise.¹⁻⁴

TURMERIC AS AN ANTI-INFLAMMATORY.

Turmeric contains a number of polyphenols called curcuminoids, which have significant antioxidant properties, helping to reduce the levels of harmful inflammatory molecules that cause damage in highly active tissues such as skeletal muscle and the heart.¹⁻⁴ Moreover, these benefits have been shown to be generally achievable through dietary supplementation at doses of between 200-2000 mg/day over a period of 2 weeks to 6 months, although over the short-term daily doses of between 1.5 to 2g have been suggested to be the most beneficial.^{2,4}

TURMERIC AS AN ANALGESIC (PAIN RELIEVER).

The mechanism of Turmeric in acting as a pain reliever is thought to be linked to its ability to reduce inflammation.^{3,4} A number of studies have suggested that by inhibiting pro-inflammatory molecules and reducing the activation of inflammatory signalling pathways, Turmeric prevents pain sensitisation and dampens pain-transmitting pathways.^{3,4} For this reason, Turmeric has been highlighted as having the potential to act as a stand-alone analgesic, or as an additive therapy to other pain-relieving medications such as Ibuprofen, although more research is needed to definitively establish this.^{3,4}

References:

1. Li, C. et al. Curcuminoids: Implication for inflammation and oxidative stress in cardiovascular diseases. *Phytother. Res.* 33, 1302-1317 (2019).
2. Salehi, B. et al. The therapeutic potential of curcumin: A review of clinical trials. *Eur. J. Med. Chem.* 163, 527-545 (2019).
3. Eke-Okoro, U. J. et al. Curcumin in Turmeric: Basic and clinical evidence for a potential role in analgesia. *J. Clin. Pharm. Ther.* 43, 460-466 (2018).
4. Gaffey, A., Slater, H., Porritt, K. & Campbell, J. M. The effects of curcuminoids on musculoskeletal pain: a systematic review. *JBIC Database Syst. Rev. Implement. Rep.* 31 (2017).



Whilst Ginger can be an effective performance enhancer, it can also prove highly beneficial in improving your quality of sleep by acting as a pain reliever.¹⁻³

HOW DOES GINGER ACT AS A PAIN RELIEVER?

Most athletes, including up to 70% of endurance athletes competing in triathlons, marathons and ultramarathons report using non-steroidal anti-inflammatories (NSAIDS e.g. Advil, Ibuprofen, etc.) for pain relief on a regular basis.¹ However, NSAIDS have been shown to have a number of harmful side-effects including:¹

- Gastrointestinal (GI) dysfunction (resulting in diarrhoea, cramping, and a prolonged inflammatory response).
- Bronchoconstriction (making breathing more difficult).
- Impairment of connective tissue repair.
- Prevention of protein synthesis (reducing muscle regeneration post-exercise).
- Increased risk of cardiovascular events.

Ginger, on the other hand, taken at a dose of 2 g/day for 5 days, has been shown to:¹

- Act as an analgesic (pain reliever), through:
- Reducing muscle pain.
- Improving GI function (less cramping and diarrhoea).
- Reducing inflammation and accelerating recovery.

It does this through a similar mechanism to NSAIDS (by blocking a series of enzymatic pathways) but additionally blocks a receptor called Vanilloid 1 which influences pain processing in the central and peripheral nervous system, as well as preventing the release of pro-inflammatory molecules that exacerbate exercise-induced muscle pain.¹

In this regard, each serving (2.5g) of our Energise Tea contains 0.4g of Ginger extract. This means that a 70kg individual ascribing to our recommended regimen of teas benefits from ±1g of Ginger supplementation per day, which taken regularly should provide both pain relief and improved endurance capacity.



References:

1. Wilson, P. B. Ginger (*Zingiber officinale*) as an analgesic and ergogenic aid in sport: a systemic review. *J. Strength Cond Res* 29 , 2980-2995 (2015).
2. Misawa, K. et al. Ginger extract prevents high-fat diet-induced obesity in mice via activation of the peroxisome proliferator-activated receptor δ pathway. *J. Nutr. Biochem.* 26, 1058-1067 (2015).
3. Banihani, S. A. Ginger and Testosterone. *Biomolecules* 8 , (2018).
4. Fan, W. et al. PPAR δ Promotes Running Endurance by Preserving Glucose. *Cell Metab.* 25, 1186-1193.e4 (2017).



The leaves of the Ginkgo Biloba tree are purported to contain high levels of flavonoids and polyphenols which have a number of cognitive benefits, including:¹⁻⁴

- Increasing the levels of Brain-derived Neurotrophic Factor (BDNF), improving neuroplasticity (the ability of your brain to change the structure of neural pathways in response to certain signals), memory and concentration.
- Reducing the levels of stress hormones such as cortisol.

HOW DOES GINKGO BILOBA ASSIST SLEEP?

BDNF is known to be a major contributor to neuroplasticity, which is important for protecting against various neurodegenerative diseases.¹⁻⁴ Low levels of BDNF have also been correlated with sleep impairment, where chronic stress leading to sleep deprivation is associated with low BDNF levels.⁴

By reducing the levels of stress hormones such as cortisol, and normalising BDNF levels in the brain, Ginkgo Biloba could help to improve sleep quality in addition to boosting other areas of cognition such as concentration and memory.^{1,2,4}

References:

1. Zhang, Z., Tong, Y., Zou, J., Chen, P. & Yu, D. Dietary supplement with a combination of *Rhodiola crenulata* and Ginkgo Biloba enhances the endurance performance in healthy volunteers. *Chin. J. Integr. Med.* 15, 177-183 (2009).
2. Sadowska-Krępa, E. et al. Effects of Six-Week Ginkgo Biloba Supplementation on Aerobic Performance, Blood Pro/Antioxidant Balance, and Serum Brain-Derived Neurotrophic Factor in Physically Active Men. *Nutrients* 9, (2017).
3. Bing, Y. & Zhaobao, W. Effects of Ginkgo Biloba extract on free radical metabolism of liver in mice during endurance exercise. *Afr. J. Tradit. Complement. Altern. Med. AJTCAM* 7, 291-295 (2010).
4. Eckert, A. et al. The link between sleep, stress and BDNF. *Eur. Psychiatry* 41, S282 (2017).

LAVENDER



Lavender (*Lavandula*) oils have a well documented history of use in oral- and aromatherapies for their anti-anxiety (anxiolytic) and calming effects.¹⁻³ Recent studies have now shown that this could also help to relieve some of the symptoms of anxiety and stress, most notably disturbed sleep.¹⁻³

HOW DOES LAVENDER IMPROVE SLEEP?

Lavender has a complex chemical composition but two of its major constituents, linalool and linalyl acetate, are thought to be behind its reported anxiolytic and calming effects.^{2,3} By binding to and inhibiting GABA receptors and presynaptic calcium channels in the brain, lavender induces a relaxed state, which has been shown in some studies to be as effective as certain medications in treating mild anxiety.¹⁻³

By helping you relax and relieving stress, lavender enhances sleep thereby assisting recovery. A major benefit here is that lavender is also non-sedating, meaning that it is less likely to affect your quality of sleep as opposed to other sedating medications.¹⁻³ This means that lavender is likely to leave you more alert and active the next morning.

References:

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