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LIFESTYLE MANAGEMENT THE IMPORTANCE OF SLEEP

This article kicks off our lifestyle management eBook series and looks at the extremely important topic of sleep.

It is accepted that everything within the animal kingdom must sleep, yet the exact purpose and mechanism of sleep are only partly understood.

It always makes for an interesting topic as everyone can relate to it and has plenty of experience of it too.

Understanding sleep, the power of it and how to get as much high quality sleep as possible is one of the healthiest things we can do. We can all relate to how a loss of sleep can take its toll on our energy, mood, decision-making and ability to handle stress.

Sleep should therefore be of top priority for our clients, who are typically seeking to improve their bodies and health. Many people try to sleep as little as possible, but just as exercise and nutrition are essential for optimal health and happiness, so is sleep.

No other activity delivers so many benefits with so little effort. It has a direct correlation to the quality of our waking life. This article will look at the true power of sleep, how it works and the importance of it.

The Role Of Sleep

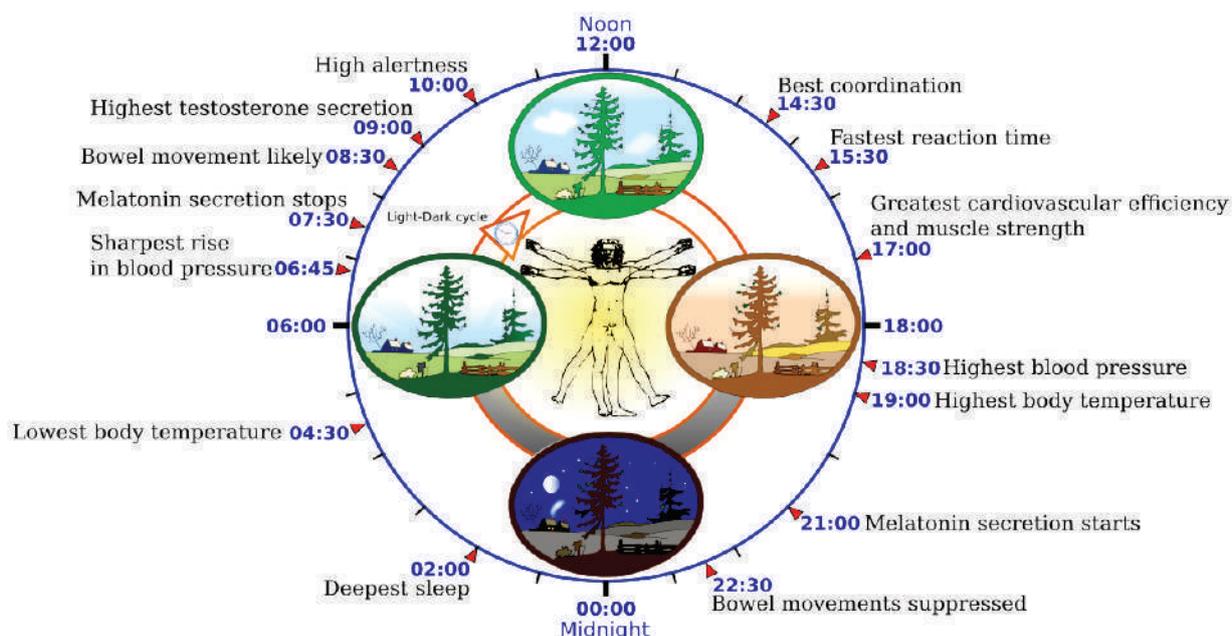
The neuroscience of sleep is the study of the neuroscientific and physiological basis of the nature of sleep and its functions.

Despite sleep being of such importance to the human body, the purposes and mechanisms are only partially understood. It is assumed the key benefits we get from enough sleep have evolved over time, thus creating greater dependence on getting sufficient and quality sleep.

Sleep is a naturally recurring state characterized by reduced or absent consciousness, and the inactivity of nearly all voluntary muscles.

Sleep timing is controlled by the circadian clock, and in humans, to some extent by willed behavior. The circadian clock (also known as circadian oscillator) allows us to coordinate our biology and behavior with daily and seasonal changes in the day – night cycle. This in-built biological clock operates over a 24-hour period and receives daily corrective signals from the environment, primarily daylight and darkness. Circadian clocks are the central mechanisms which drive circadian rhythms.

The term circadian comes from the Latin ‘circa’, meaning ‘around or approximately’, and diem meaning ‘day’. An endogenous (built-in), entrainable oscillation of about 24 hours.



This clock is reset as the environmental changes through our ability to sense external cues of which the primary one is light. This clock is considered to be intertwined with most cellular processes.

When we sleep, the body doesn't just shut down and switch off. In fact, while we rest, the brain oversees a wide variety of biological maintenance that improves our health markers and aids recovery.

Below is a number of key proposed functions of sleep:

RESTORATION

Sleep is restorative, and without it we are not able to work, learn, create and communicate at our highest level. With time, lack of sleep can lead to mental and physical breakdown.

Sleep has also been shown to be linked to the immune system. Sleep loss can impair our immune function, so by sleeping longer we can invest in strengthening our immune system.

Our sleeping brains have been shown to help remove metabolic waste products at a faster rate than during active state, further enhancing the restorative function of sleep. When awake we are exposed to a greater number of factors such as nutrition, stress and toxins, putting greater strain on our detox systems. This can lead to a high level of free radicals in the body. Also, with a higher metabolic rate during the day, which produces greater levels of reactive oxygen species, there is a larger amount of damaging cells within the body when awake.

When we sleep, our metabolic rates reduce and free radical production is decreased, allowing restorative processes to take over.

The metabolic phase during sleep is anabolic, as we see a greater release of anabolic hormones such as growth hormone. This further adds to the restorative processes of sleep.

MEMORY PROCESSING

There have been numerous studies conducted to show the correlation

between sleep and memory. Furthermore sleep deprivation has been linked to a reduction of 'working memory'. This is important because it keeps information active for further processing and supports higher-level cognition functions such as decision-making, reasoning and memory.

PRESERVATION

It's been suggested that sleep can serve as a 'preservation and protection' system to reserve energy and reduce risk.

The Stages Of Sleep

There are a number of stages of sleep that occur every time we get some rest. These stages represent what's happening beneath the surface, and all play an important part to the benefits that occur from the rest.

There are two main types of sleep:

1. NON-REM (NREM) SLEEP

This is essentially a 3-stage sleep cycle, with each being a deeper level than the previous one.

Stage N1 (Transition to Sleep)

This is a stage between sleep and wakefulness. The muscles are active, the eyes roll slowly under the eyelids, muscle activity slows down and we are easily awakened.

Stage N2 (Light Sleep)

This is considered the first stage of true sleep, and is characterised by an increase in 'theta' activity within the brain.

We also become harder to awaken, eye movement stops, heart rate slows and body temperature decreases.

Stage N3 (Deep Sleep)

This stage is also known as 'slow-wave sleep', and is characterised by an increase in 'delta' activity within the brain. During this time, blood flow

to the brain is decreased and passed to the body to enhance its restorative benefits. We are difficult to awaken at this stage.

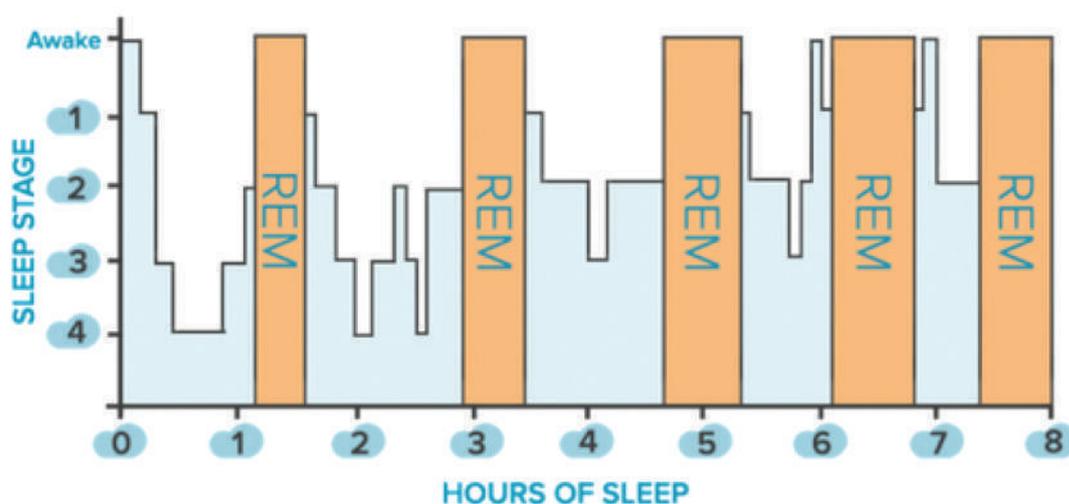
2. REM (RAPID EYE MOVEMENT) SLEEP

REM sleep has been given this name as our eyes can be seen moving back and forth in this stage. It can also be known as 'dream sleep' and usually occurs about 60-90 minutes after falling asleep. Eye movement, heart rate and blood pressure increase, yet arm and leg muscles are paralysed.

Every time we sleep we are likely to go through all stages of this sleep cycle. Our bodies move back and forth between REM and N3 sleep to form a complete sleep cycle. Each cycle typically lasts about 90 minutes and repeats four to six times over the course of the night.

Typically, the majority of deep sleep occurs in the first half of the night, with REM stages becoming longer with more light N2 sleep later into the night.

This is why many people report waking up after a number of hours sleep, as their sleep is getting lighter and they are easily awakened.



Each sleep within this sleep cycle has potential benefits to the sleeper. A normal adult spends around 50% of total sleep time in stage 2 sleep, 20% in REM sleep and 30% in stage 1 and 3 sleep.

Stage N3, deep sleep, is considered one of the most important for making us feel energized and refreshed from resting. It is heavily involved in maintaining our health, providing growth and development, repairing of muscles and tissues, and boosting the immune system. It essentially renews the body.

REM sleep renews the mind, and is important to ensure a healthy memory and learning ability. During REM sleep, the brain consolidates and processes the information we have learnt that day, while forming neural connections to strengthen the memory. It also replenishes its supply of neurotransmitters including feel good chemicals like serotonin and dopamine.

It's evident that we need a mixture of all sleep stages for optimal health and restoration.

How Much Sleep

With modern lifestyles people are sleeping less than ever, with the average person getting less than 7 hours per night.

While sleep requirements vary from person to person, this average is not enough for most, and is leading many people into chronic sleep disorder.

Most people sleep as much as they need, not as much as they should for optimal health and performance. In reality, most healthy adults need between 7.5-9 hours of sleep per night for best results. Young adults and children are considered to require even more.

AVERAGE SLEEP NEEDS BY AGE		AVERAGE SLEEP NEEDS BY AGE	
Newborn to 2 mos	12 to 18 hrs	5 to 12 years old	10 to 11 hrs
3 mos to 1 year old	14 to 15 hrs	12 to 18 years old	8.5 to 10 hrs
1 to 3 years old	12 to 14 hrs	Adult (18+)	7.5 to 9 hrs
3 to 5 years old	11 to 13 hrs		

There is no system or protocol to show how many hours we should get exactly, and the best way is to evaluate how we feel throughout the day. If energy is low, memory is poor and we don't feel alert, then chances are we need more sleep.

Sleep Deprivation

Everyone experiences trouble sleeping from time to time and this can be the result of a number of different factors.

A problem may occur when regular disturbances happen frequently and these can begin to affect daily life too. This can lead to a sleep disorder.

Sleep disorders are not just a simple diagnosis of lack of sleep, but all the negative symptoms that can be associated with it, namely poor energy, mood and health markers.

Many sufferers from sleep disorders tend to have an underlying medical or mental health problem, while those with sound health tend to sleep well.

This problem alone can lead to a number of health problems, and even a minimal loss of sleep can affect health and performance.

Just like eating disorders, many people go untreated and have difficulty linking their symptoms to a problem. Also, for those who cannot resolve their sleeping habits themselves, they should seek out the help of someone trained in sleep medicine.

SIGNS AND SYMPTOMS

Everyone will have the odd poor night's sleep leaving them sleep deprived for a short time, but if this becomes a chronic problem then a sleep disorder is likely.

You may be sleep deprived if you:

- **Need an alarm clock in order to wake up on time**
- **Rely on the snooze button**
- **Have a hard time getting out of bed in the morning**
- **Feel sluggish in the afternoon**
- **Get sleepy in meetings, lectures, or warm rooms**
- **Get drowsy after heavy meals or when driving**
- **Need to nap to get through the day**
- **Fall asleep while watching TV or relaxing in the evening**
- **Feel the need to sleep in on weekends**
- **Fall asleep within 5 minutes of going to bed**

We may all feel these symptoms from time to time, but if it leads to regular occurrences of the below effects, the person is likely to be chronically sleep deprived.

The effects of sleep deprivation include:

- **Fatigue, lethargy, and lack of motivation**
- **Moodiness and irritability**
- **Reduced creativity and problem-solving skills**
- **Inability to cope with stress**
- **Reduced immunity; frequent colds and infection**
- **Concentration and memory problems**
- **Weight gain**
- **Impaired motor skills and increased risk of accidents**
- **Difficulty making decisions**
- **Increased risk of diabetes, heart disease, and other health problems**

Types Of Sleep Disorders

1. Insomnia

Insomnia is the most common type of sleep disorder and is essentially the inability to get enough sleep to feel fully rested and energized. It can typically be linked to underlying problems such as stress, anxiety, depression, or lifestyle choices such as medications, jet lag, nutrition choices or family issues.

Many cases of insomnia can be resolved following the simple changes recommended in the 'how to sleep better' section of the article.

Common symptoms of insomnia include:

- **Difficulty falling asleep at night or getting back to sleep after waking during the night**
- **Waking up frequently during the night**
- **Your sleep feels light, fragmented, or exhausting**
- **You need to take something (sleeping pills, nightcap, supplements) in order to fall asleep**
- **Sleepiness and low energy during the day**

2. Sleep apnoea

Sleep apnoea occurs when the upper airways become blocked, forcing breathing to temporarily stop. The result is that the person awakes, but often they never remember doing so. This constant and regular waking leads to poor overall sleep and the negatives associated with it.

This is a common yet very serious disorder that will need treated with help of medical professionals. This is usually done so via Continuous Positive Airway Pressure (CPAP), which delivers a constant stream of air to the person via a mask while they sleep.

Common symptoms include:

- **Loud chronic snoring**
- **Frequent pauses in breathing during sleep**
- **Gaspings, snorting, or choking during sleep**
- **Feeling exhausted after waking and sleepy during the day, no matter how much time you spent in bed**
- **Waking up with shortness of breath, chest pains, headaches, nasal congestion, or a dry throat**

3. Restless legs syndrome (RLS)

RLS is the constant moving or shuffling of legs or arms due to discomfort, aching or irritable sensations. Common symptoms include:

- Uncomfortable sensations deep within legs, accompanied by a strong urge to move them
- The leg sensations are triggered by rest and get worse during the night
- The uncomfortable sensations temporarily get better when you move, stretch, or massage your legs
- Repetitive cramping or jerking of the legs during sleep

4. Narcolepsy

Narcolepsy involves excessive, uncomfortable daytime sleepiness which can result in the person falling asleep at any given time. This is due to the dysfunction of the brain mechanisms that control sleeping and waking.

Common symptoms include:

- Seeing or hearing things when you are drowsy or starting to dream before you are fully asleep
- Suddenly feeling weak or losing control of your muscles when you are laughing, angry, or experiencing other strong emotions
- Dreaming right away after going to sleep or having intense dreams
- Feeling paralysed and unable to move when you are waking up or dozing off

Our biological clocks can sometimes be knocked out of sync, which can throw our typical sleeping patterns off. Jet lag, insomnia and shift work are common ways to disrupt this system.

How To Sleep Better

Those people with poor sleeping habits or disorders commonly share the same bad habits.

There are a number of sleep promoting techniques and considerations that can be easily integrated into someone's evening routine.

GET A ROUTINE

Syncing with the bodies natural clock, the circadian rhythm is one of the

most effective methods we have to getting a good night's sleep.

Getting into a strict and consistent routine of going and getting out of bed at the same time each day can have huge benefits.

It's also important to experiment with different sleep and wake times, as various set ups will benefit people differently. So not only find the ideal length of sleep, but also the times this sleep should start and finish.

CONTROL THE SURROUNDINGS

On top of finding the best sleeping routine, we can naturally encourage the body to feel more alert or relaxed. A hormone known as melatonin is released when we are in dark surroundings, as it helps the body regulate the sleep- wake cycle.

If we are exposed to little to no sunlight during the day, we can release melatonin making us sleepy during the day.

In a bright environment, melatonin production is stopped. The same occurs at night when we do want a release of melatonin to induce sleep. If we are exposed to bright light or electrical equipment just before bed, it can slow down the release.

The goal should be to spend more time in daylight during the day, with less exposure to it (including artificial light) at night.

KEEP THE BEDROOM FOR SLEEP

Ensuring the bedroom is optimized for relaxing, unwinding and sleeping is essential. The bedroom should therefore become a place to be associated for sleep which will send a powerful signal to help us nod off.

Other important factors here are:

- **Eliminating any noises that may disturb our sleep**
- **Keeping the bedroom at the right temperature**
- **Removing any electronic equipment**

- **Ensuring the room is dark enough**
- **Ensuring the bed is comfortable enough**

IMPROVE NUTRITION AND EXERCISE HABITS

Good nutrition habits can drastically improve sleep quality, particularly in the last hours before bed. Some important considerations are:

- **Avoid eating large meals before bed**
- **Avoid drinking too much liquid**
- **Avoid caffeine in the latter part of the day**
- **Avoid alcohol before bed**

A small bedtime snack containing a balance of protein, fat and carbohydrates can be ideal to help people fall asleep, as that feeling of being satisfied can help the body rest.

Daily exercise can also lead to improved sleep, while exercising too late may disturb the body's natural wake-sleep cycle as it can act as a heavy stimulus on the body.

REDUCE STRESS AND RELAX

Stress related to family, money, work or other day-to-day difficulties can be a common sleep disruptor. Managing these stressors and using pre-bed relaxation techniques can be effective in aiding a better nights sleep.

Some common techniques are:

- **Write down any problems or issues**
- **Conduct some deep breathing techniques**
- **Use progressive muscle relaxation techniques**
- **Avoid any stressing tasks or thoughts before bed**
- **Keep the bedroom clean and tidy**
- **Have a hot shower or bath**
- **Do something you enjoy before bed**

SUMMARY

We now know the impact sleep can have on the body and health. By educating our clients on this important topic, we can see drastic improvements in those with sleep disorders and those who are sleep deprived.



LIFESTYLE MANAGEMENT THE IMPORTANCE OF EXERCISE

We know the importance of following a good nutritional programme and the benefits of doing so. We may also know that combining this with regular physical activity is going to bring the best results for those interested in a complete health and fitness regime.

As trainers and coaches we need to help show people how to do this while achieving as many of the benefits from it.

The purpose of this article is not to teach you about good exercise and training, or how to do it (that's probably a separate article entirely), but to understand the physiological and psychological responses of it, and how that should affect a person's nutritional approach.

The information contained here is for the majority of trainees undertaking regular exercise and those with sports- specific needs and requirements will be discussed in further ebooks.

The Benefits Of Exercise And Training

There are a number of health and fitness benefits associated with regular exercise and training. We have two main forms of exercise, aerobic and anaerobic.

There are a number of similar benefits to both, but each also provides additional benefits not seen from the other. These have been summarized below:

AEROBIC EXERCISE

Walking, jogging, running, cycling and swimming are all forms of aerobic exercise.

Aerobic fitness can be defined as the ability to take in, transport and utilize oxygen in the body to produce energy.

With long duration, sub maximal exercise such as walking and running the body uses a combination of fats and carbohydrates to produce energy.

THE BENEFITS OF ANAEROBIC EXERCISE
Heart
Increase size and strength
Reduce resting heart rate
Reduce risk of heart disease
Lungs
Increase functional capacity during exercise and rest
Metabolic Function
Decrease insulin resistance and improved glucose tolerance - beneficial for treatment and prevention of diabetes
Reduced body fat
Increase maximal oxygen uptake for greater efficiency
Muscular Changes
Improved perception of muscle tone
Psychological Factors
Increased social interaction
Distraction from daily routine
Decreased depression and anxiety

ANAEROBIC EXERCISE

The term 'anaerobic' means 'in the absence of oxygen' or 'without oxygen'. During anaerobic exercise, your body's demand for oxygen is greater than the available oxygen supply.

While aerobic exercise is fueled by oxygen, anaerobic exercise is fueled by energy stored in muscles.

Most anaerobic exercise is extremely high intensity, short duration exercise lasting from just a few seconds to minutes.

This is the direct opposite to aerobic exercise, which involves sustained activity of moderate intensity.

THE BENEFITS OF AEROBIC EXERCISE
Heart
Increase size and strength
Reduce resting heart rate
Reduce risk of heart disease
Lungs
Increase functional capacity during exercise and rest
Metabolic Function
Decrease insulin resistance and improved glucose tolerance - beneficial for treatment and prevention of diabetes
Reduced body fat
Increase maximal oxygen uptake for greater efficiency
Muscular Changes
Improved perception of muscle tone
Improved muscle strength and muscle mass
Decreased muscle soreness
Improved joint protection
Increase bone density
Psychological Factors
Increased social interaction
Distraction from daily routine
Decreased depression and anxiety

Exercise Fundamentals

Having an understanding of the exercise fundamentals that apply to both aerobic and anaerobic training ensures that the desired benefits previously mentioned are produced. Also, it helps us further understand how these types of exercise affect the body and the nutritional demands to best support it.

ELEMENTS OF TRAINING

There are a number of elements that should be considered when someone undertakes exercise. These key elements are common to both aerobic and anaerobic training but are essentially represented differently due to the differences in training styles.

It is these key elements that will produce the key benefits of the chosen exercise and force the body to make adaptations. From a nutritional stand point, the person's nutrition programming should reflect how they have set these training elements.

Training Volume

The volume of training is essentially the total amount of work completed. For aerobic training the volume is typically calculated by the total distance completed i.e. how far they ran, or via total time total time.

Training Intensity

Intensity is described as how much 'effort' was applied to the session.

For anaerobic work such as weight training, intensity is typically measured as the percentage of the maximal weight that it is possible to lift for 1 repetition in that chosen exercise.

If someone has a 1 rep max of 100 pounds in the bench press, yet was only lifting 60 pounds, they are working with a training intensity of 60%.

In relation to this, intensity can also be matched to how close to failure

the person goes. So if the person pushes to absolute failure (meaning they can't complete another rep), then intensity is considered much higher than if they stop short of failure by 2-3 reps.

For aerobic training, this intensity element is typically classified as a percentage of maximal heart rate.

Maximal heart rate can be calculated using the following equation,

$$\text{Max heart rate} = 208 - (0.7 \times \text{age in years})^*$$

**Estimation only.*

Therefore someone performing aerobic exercise at 140bpm with a max heart rate of 200 is considered to have an intensity of 70%.

What we need to understand is that the volume conducted and the intensity used are directly correlated. A change to one element will and should result in a change to the other. Furthermore, these two elements are strongly linked to the type of exercise that should be conducted to achieve this correlation, be it aerobic or anaerobic training.

The table below shows how these should be correlated:

TYPE OF ACTIVITY	VOLUME	INTENSITY
Aerobic, e.g.: running, walking, cycling	30-60 mins / 4-5 day per week	50-75% of max heart rate
Anaerobic resistance training e.g. weight lifting	20 sets per session / 3-4 days per week	80-90% of 1 RM

As you can see, as volume is reduced the intensity can be increased, usually resulting in a transition between aerobic style training to anaerobic.

Responses To Exercise

So far we have looked at the two different types of training, their benefits and how their fundamental principles should define them.

Although this alone can help us define the right nutritional settings, we will first look at the physiological and psychological responses of the body to these styles of training. This will improve our knowledge and confidence in the nutritional recommendation we make.

MUSCULAR RESPONSE

For exercise, it's clear to say that skeletal muscle is one of the key factors designed to produce the required force to make it happen.

We should therefore understand its key factors and the response or adaptations we can go through as a result of exercise.

Aerobic Training Response

Long-term endurance exercise has shown to increase someone's maximal oxygen uptake, which will result in the ability to deliver more oxygenated blood to the working skeletal muscles. It can also enhance a muscle fibres ability to extract and use oxygen for energy production.

These responses occur through adaptations that increase the oxidative capacity of muscle, and increase the number and size of mitochondria.

Anaerobic Training Responses

Long-term anaerobic training such as weight lifting will most probably result in increases in muscular strength and size. The primary way that muscle hypertrophy occurs is by growth of individual muscle fibres. Longer term increases in muscle strength result primarily from muscle hypertrophy.

Increased muscle size, and the force it can produce, has been shown to be directly related to its cross sectional area. Furthermore, a greater rate of growth is typically seen from our type II (fast twitch) fibres than our type I (slow twitch) fibres. Finally, transition of type IIx fibres to IIa frequently occur with this type of training.

Delayed-Onset Muscle Soreness (DOMS)

DOMS are a common problem for aerobic and anaerobic trainers alike, and are the result of muscle fibre damage. This results in a muscular pain or discomfort approximately 16-24 hours after a training session. This soreness is usually located in the most worked muscles from that training session and can peak around 24-48 hours after.

It is typically associated with exercise that consists of a lot of eccentric loading or movements and causes an inflammatory response within the muscle. This damage is readily repaired with adequate rest and recovery.

ENDOCRINE RESPONSES

Most people conduct exercise to elicit a response from the body, be it improved fat burning, muscle gain, strength or endurance.

What we forget is that the neuroendocrine system is also of primary importance to our exercise performance and the adaptations occurred from it.

Our neuroendocrine system is linked to a whole host of metabolic and hormonal regulations and responses. With exercise, the body responds by releasing a large number of anabolic and catabolic hormones that are triggered to deal with the remodeling and repair of tissue.

We not only see instant hormonal response patterns to exercise but subsequent adaptations as a result.

Out of the many hormones, the ones that appear to show the greatest response to exercise (weight training in particular) are:

Testosterone

Weight training has been shown to increase total testosterone levels in men only, which is considered to have one of the strongest links to triggering further anabolic processes and hormones in the body.

Growth Hormone (GH)

GH, also known as somatotropin, is a peptide hormone that stimulates growth, cell reproduction and regeneration in humans.

Resistance training has been shown to elevate concentrations of GH 30 minutes after exercise, and is similar in men and women. There appears to be no long term changes in resting GH concentrations.

Cortisol

Cortisol is a steroid hormone, more specifically a glucocorticoid, produced by the fasciculata of the adrenal cortex. It is released in response to the stress of exercise and similar elevations appear in men and women.

It acts as a catabolic hormone in the body, resulting in a greater release of lipids and amino acids into the blood stream. This can result in protein degradation and decreases in protein synthesis.

Insulin Like Growth Factors (IGF's)

IGF's are small polypeptide hormones that are secreted by the liver in response to GH stimulated DNA synthesis. They respond in the body just like 'insulin', creating an anabolic environment and boost protein synthesis following resistance training.

Insulin

Insulin is a peptide hormone, produced by beta cells in the pancreas, and is central to regulating carbohydrate and fat metabolism in the body. It causes cells in the skeletal muscles and fat tissue to absorb glucose from

the blood. It is an anabolic hormone with a potent up-regulating effect on muscle protein synthesis.

Serum insulin concentrations have been shown to decrease during an exercise session.

Catecholamines

Catecholamines are derived from the amino acid tyrosine and the most abundant are adrenaline, noradrenaline and dopamine. These are released from the adrenal glands.

They are important for increasing energy availability, force production and muscle contraction rate.

They are considered part of the 'fight or flight' response and elevation of these are seen after (and occasionally before) intense training sessions.

OVERTRAINING

Overtraining may have become an overused word, and some do not believe it can occur, as the body is a highly adaptable machine.

What does seem clear is that when we see intense and long lasting elevated responses to exercise, both on a physiological and psychological aspect, overtraining does appear possible.

The result is usually a short-term decrease in performance capacity, for which restoration may take several days to a few weeks.

Markers of overtraining:

- **Decreased desire to train, decreased joy from training**
- **Decreased performance**
- **Decreased percentage of body fat**
- **Decreased maximal oxygen uptake**
- **Altered blood pressure**
- **Increased muscle soreness**
- **Decreased muscle glycogen**

- Altered resting heart rate
- Increased submaximal exercise heart rate
- Decreased lactate
- Increased creatine kinase
- Altered cortisol concentration
- Decreased total testosterone concentration
- Decreased ratio of free testosterone to cortisol
- Decreased ratio of total testosterone to sex hormone-binding globulin
- Decreased sympathetic tone (decreased nocturnal and resting catecholamines)
- Increased sympathetic stress response

Nutrition For Exercise Training

The previous section looked at the benefits of exercise, how it works and how the body responds to it.

As nutrition coaches, it's important to understand how nutritional/supplemental strategies can indeed have an effect on all of this, and how we adjust our recommendations for someone who is exercising.

We can now look at some of the most researched and effective strategies that we can use to ensure our clients are enhancing the benefits of exercising, and reducing the negatives.

No matter what level of exercise or sport undertaken, the goal should be to always establish a solid nutrition foundation to adequately set the stage for reaching optimal training performance and recovery.

Below are a number of nutritional considerations for people undertaking regular athletic and exercise routines.

ENERGY REQUIREMENTS

For an active person it is important to always calculate caloric needs based on their individual needs. Most likely this will need to be adjusted

depending on their daily activity levels, so the standard daily recommendations should not be used.

Many people find exercise performance and recovery to be highly related to optimal calorie intake to balance their specific energy expenditure.

CARBOHYDRATE REQUIREMENTS

Exercise intensity and duration is a key factor when determining the carbohydrate needs for an active person. Carbohydrates are necessary to replenish and maintain muscle glycogen levels to optimize performance and reduce fatigue.

An effective strategy is a pre, during and post intake of carbohydrates when exercising, again to ensure adequate glycogen levels.

A further benefit to this is the hormonal response, as carbohydrates are potent activators of insulin, thus keeping the body in that anabolic environment, and reducing potential release of catabolic hormones.

PROTEIN REQUIREMENTS

Protein requirements for exercising individuals will be higher than non-exercisers and this is to help boost protein synthesis, reduce recovery time and maintain a positive nitrogen balance.

It is suggested that protein intake be set to 1.5 -2g per kg per day for regular exercisers, with protein sources being of high quality.

FAT REQUIREMENTS

Healthy fats should always have a place in an exerciser's diet, but less may be required to ensure adequate amounts of protein and carbohydrates are met.

A main benefit of including healthy fats in the diet is to help maintain testosterone levels which may be suppressed during periods of high intensity training.

NUTRIENT TIMING

Nutrient timing may not appear to be as important as we once thought, especially when it comes to improving body composition. However, for the exerciser, nutrient timing can and should have a place.

Programming and timing of adequate dietary ingestion can improve performance and recovery from exercise. The following guidelines are typically used:

4 - 6 hours pre-training	Balanced whole food meal containing carbohydrates from starch
30 - 60 mins pre-training	Small snack or shake containing protein (15-30g) & carbohydrates (30-60g)
30 - 60 mins post training	Small snack or shake containing protein (15-30g) & carbohydrate (30-60g)
60 - 120 mins post training	Balanced whole food meal containing carbohydrates and protein

This has been considered the 'go-to' protocol for exercisers who want to enhance energy, anabolism and recovery from their training.

SUPPLEMENTS

There are a number of supplements that may benefit the exerciser, including:

Essential Amino Acids (EAA's)

The ingestion of EAA mixture before or after training has been shown to provide potential benefits to optimise performance and limit fatigue.

EAA ingestion before and during exercise not only boosts levels of EAA's in the bloodstream but helps control increases of free tryptophan, which results in a reduction of exercise stress.

It is suggested that 4-12g EAA's a day while training is the ideal dosage.

Ingesting these with carbohydrates and protein may also improve training adaptations.

Vitamin C

Vitamin C is a powerful antioxidant that can reduce any issues of immune system suppression from exercise.

By enhancing the immune system, the exerciser can be sure they are not susceptible to illness or poor health.

Zinc

Regular exercisers have been reported to experience zinc deficits, supplementation can be used to enhance the immune status of these people.

Zinc has been shown to reduce various cold symptoms and ensure normal metabolism.

Summary

You now understand the importance of training, its various types and fundamental components. More importantly, you know how the body can respond to exercise and the nutritional recommendations required to maximise the results from it.



LIFESTYLE MANAGEMENT STRESS

We will all suffer from high states of stress at some point in our lives. In today's busy society we are involved in regular stressful life situations, along with frequent and exhausting training schedules.

This stress is a burden on the body, and if the stress becomes chronically elevated and prolonged, we can end up massively fatigued and run down. It can also put a halt on any body composition changes.

What we don't always realize is the potential damage this is doing on the inside of our bodies and how it affects our health.

Stress 101

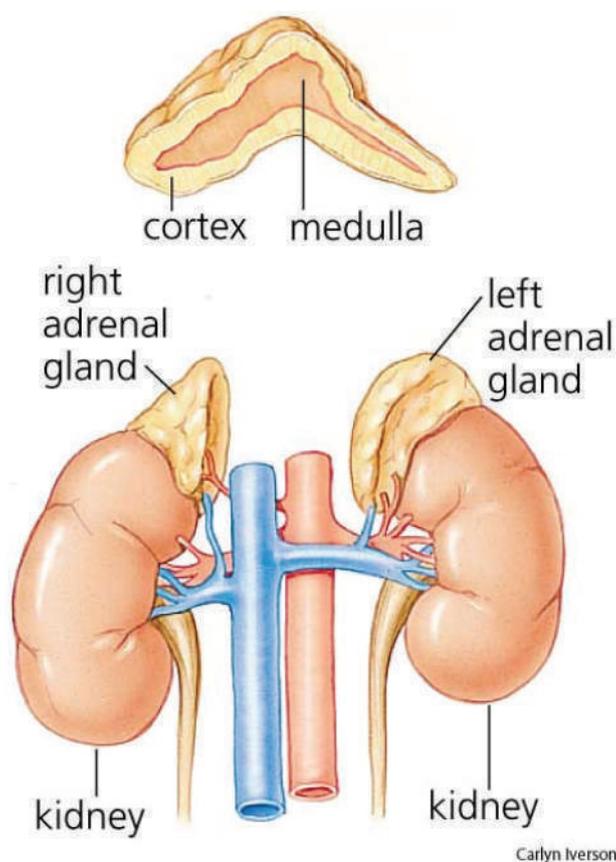
To show exactly what happens internally during a typical 'stressful' situation which we may encounter, let's look at an example:

Say you are walking on the pavement and start to cross the road after checking it's clear in both directions. Suddenly a car appears out of nowhere and is forced to swerve out of the way to avoid a collision with you.

Shortly after this event you will find your heart is racing, you are breathing heavily, sweating and shaking. You are in a state of shock.

Here's what happened internally:

Above the kidneys you will find a pair of triangular shaped glands known as the adrenals. Their main role is to help your body manage and survive during stressful situations, such as in the previous example.



At the time of noticing the car hurtling towards you, the brain has sent a nerve impulse directly to your adrenals, which will cause them to secrete adrenaline.

Adrenaline is the reason for the heightened state you feel after the event, as its role is to ensure you have the focus and energy to survive the life threatening situation. This results in high blood pressure, respiration and heart rate.

The brain also decides it requires more glucose during this stressful time, so that the body and brain has more energy to survive the situation.

This causes the release of a hormone – corticotrophin releasing hormone (CRH) – which tells the pituitary to release – adrenocorticotrophic hormone (ACTH) – which tells the adrenals to produce cortisol.

The increased blood glucose levels we see associated with stressful events are due to the increased cortisol levels. Cortisol is one of a class of hormones called – glucocorticoids (GC's).

Our bodies have actually adapted well to these sudden stressful events and can therefore effectively manage our near death experience.

We also see cortisol being released during other stressful situations such as intense training sessions. Under normal conditions, cortisol rises rhythmically throughout the night, and peaks first thing in the morning.

These natural 'one off' releases of cortisol can actually be a good thing for the body, as they help regulate immune function, repair tendons/ligaments and may even accelerate fat loss.

The problems we see with cortisol are when the hormone is elevated for long periods of time. It is chronic, low level stress that never quite goes away that leads to physical problems.

So lets look at this process again, but in a little more detail.

What Is Stress

One of the most common medical patterns seen in the health care industry is stress related illness.

There are a number of stresses, whether we recognize them or not that we will come into contact daily with. It is the intensity of each stress, the frequency with which it occurs and the length of time exposed to it that all combine to form our total stress load.

There are four major categories of stress:-

Physical Stress – such as overworking, poor nutrition, lack of sleep or athletic over training, etc.

Chemical Stress – from environmental pollutants, food intolerances or IBS, poor diet and endocrine gland intolerances.

Thermal Stress – from over heating or over chilling of the body.

Emotional and Mental Stress – from family, friends, money, work etc.

It's the combination of these stresses on the body over time that can cause stress related illnesses. Research has shown that those identified with stress related illnesses follow a series of events that occur as a reaction to chronic stress.

This series of events is known as 'General Adaptation Syndrome' (GAS) and consists of 3 key stages.

1. THE ALARM REACTION

This is the body's initial response to stress and kick starts the amount of adrenal activity, also known as a hyperadrenic response.

This pushes the body into 'full alert' mode, forcing the adrenals to produce extra amounts of hormones to respond to this heightened state of stress.

Following this state of alert, the body will need 24-48 hours to recover from this over active phase, so it begins to down regulate the over stimulated mechanisms. The person will feel more tired and want to rest, while internally the hormones involved become resistant to more stimulation.

2. THE RESISTANCE STAGE.

If the chronic stress is continued on long enough then the adrenals begin to adapt and to re-build themselves to deal with the added workload. This

stage of resistance can last many months or even 10-20+ years. This prolonged hyperadrenic response can exhaust and deplete the adrenals, leading to stage 3.

3. THE EXHAUSTION STAGE.

This prolonged alarm reaction known as hyperadrenia will eventually lead to hypoadrenia, the point where the person loses the ability to adapt to stress. Essentially, the body can no longer handle any further stress and the person may experience a total collapse of body function or specific organs or systems. Professional medical treatment is necessary here.

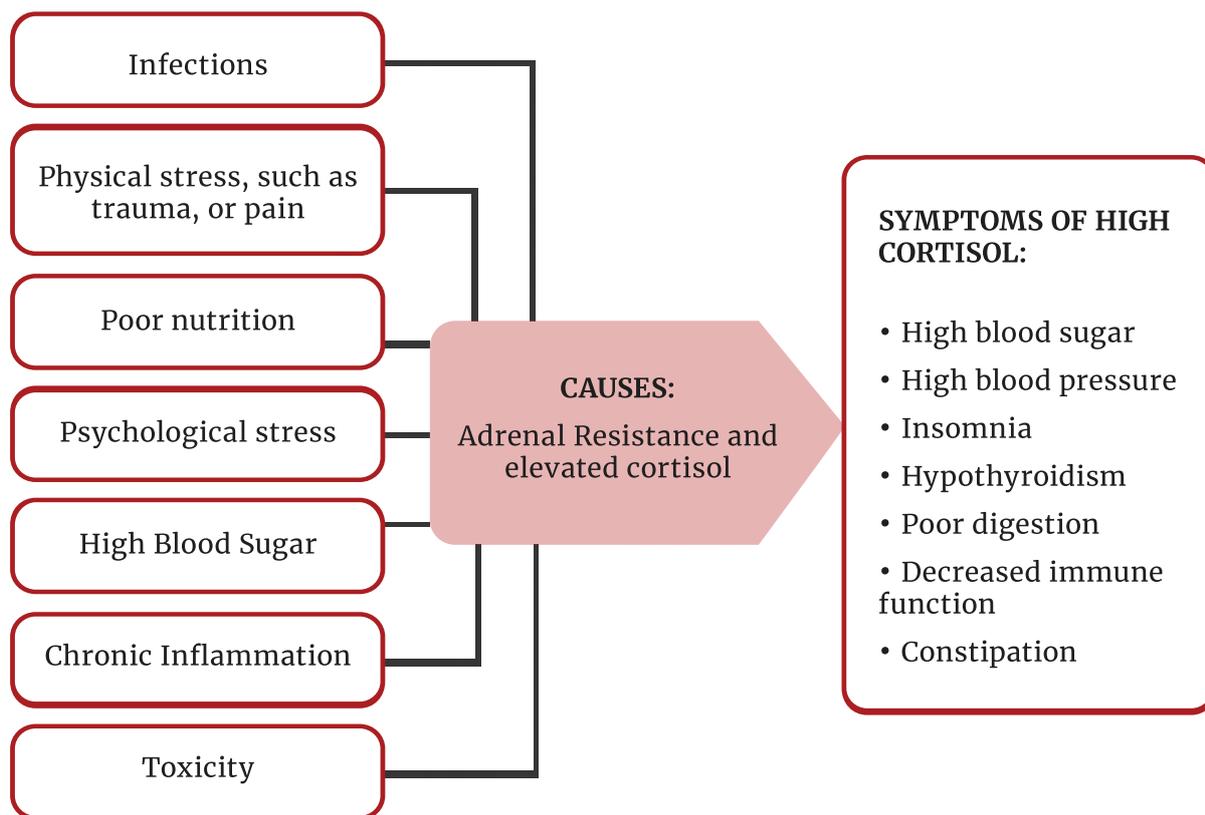
Not everyone will experience stage 3, or at least not for some time, but they will probably experience a number of other negative symptoms:

- **Increased blood sugar levels (store more body fat)**
- **Suppressed pituitary function (low testosterone)**
- **Suppression of the immune function**
- **Insomnia**
- **Reduced liver detoxification**
- **Increased inflammation**
- **Learning and memory issues**

The above are typically what occurs on the inside, but spotting the issues on the outside can be difficult.

Common symptoms are:

- **Difficulty falling asleep**
- **Feeling lethargic most of the day**
- **Suffering from allergies or falling ill frequently**
- **Suffering from mood swings or feeling emotional**
- **Excessive perspiration, dizziness or blurred vision**



If someone does reach stage 3 of hypoadrenia then there can be a large number of symptoms. Essentially, the epithelial tissue, nervous tissue, and the retina of the eye do not store glucose, so these are the most likely affected areas. It's these low levels of glucose that creates symptoms of blurred vision, headaches, nervousness, unstable behaviour, allergies and pigmentation of the skin.

The Adrenal Glands

Our adrenal glands are the 'common centres' for certain hormonal operations throughout our entire life. There are two adrenal glands, with each being situated just above the kidneys.

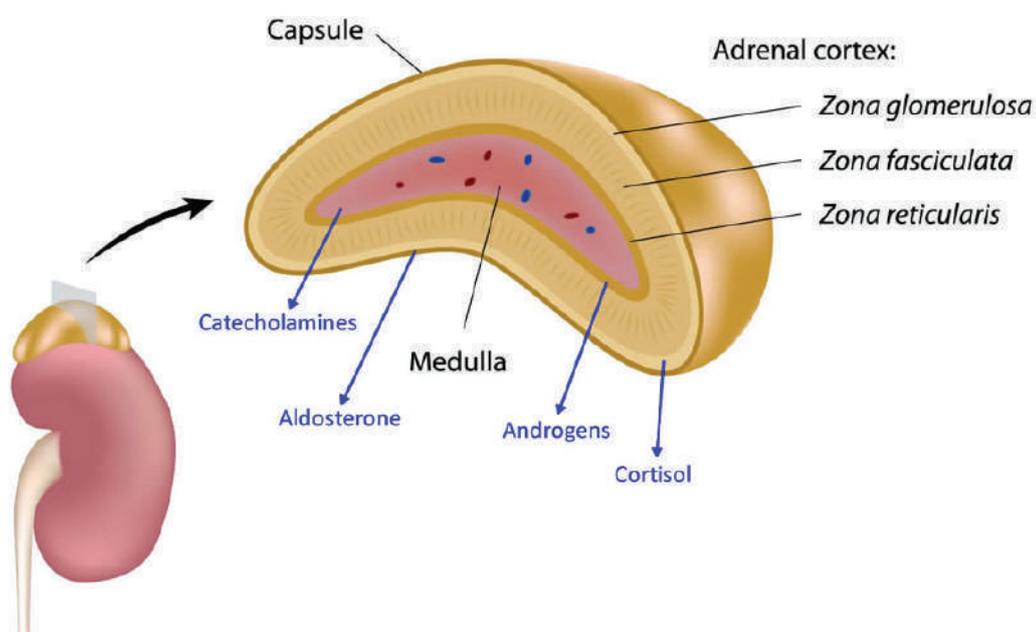
They have a significant effect on the functioning and operation of every tissue, organ and gland in the body. We cannot live without them, and how well they function has a drastic impact on how we think and feel. The adrenal glands largely determine the energy of our responses to every change in our internal and external environment.

From a nutritional stance, the adrenal glands closely affect the utilization of carbohydrates and fats, the conversion of fats and protein into energy, the distribution of stored fat, normal blood sugar regulation, and proper cardiovascular and gastrointestinal function.

The protective activity of anti-inflammatory and anti-oxidant hormones secreted by the adrenals helps to minimize negative and allergic reactions to alcohol, drugs, foods and environmental allergens.

As we get older, the adrenal glands gradually become the major source of sex hormones circulating through the body in both men and women. These are strong and powerful hormones that cause a range of emotional and psychological effects, including sex drive and tendency to gain weight.

The adrenals are also linked to our disposition to develop certain diseases and ability to overcome them. Essentially, the stronger the illness, the more critical the adrenal response becomes. This is why those with hyper and hypoadrenia will likely experience more frequent illness and longer lasting symptoms.



As previously mentioned, each kidney has an adrenal gland located above it. Each adrenal is divided into an inner medulla and an outer cortex. This inner medulla is responsible for synthesizing amine hormones (amino acids) while the cortex secretes steroid hormones. Just like in our near car collision at the start of the article, stimulation of the medulla by the nervous system causes the 'fight or flight' response.

When presented with danger, the adrenal medulla releases adrenaline (or epinephrine) and noradrenaline (or norepinephrine), which are all derived from the amino acid tyrosine. The result is a higher state of alertness, with increased heart rate, strength and metabolic rate.

The cells of the adrenal cortex secrete steroid hormones that fall into three classes:

- **Glucocorticoids (e.g.: Cortisol)**
- **Mineralocorticoids (e.g.: aldosterone)**
- **Androgens (e.g.: testosterone)**

The outermost zone is the zona glomerulosa from which the hormone aldosterone is secreted. This hormone is a major controller of the sodium and potassium levels, and thus fluid balance, within the bloodstream, cells and interstitial fluids (areas between cells).

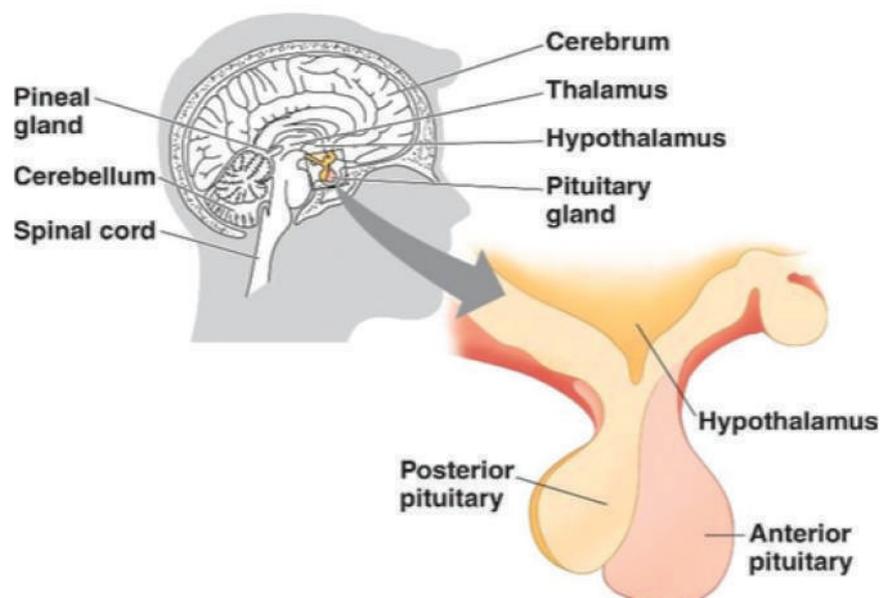
The next zone is the zona fasciculata in which cortisol is produced. Cortisol controls or greatly influences the metabolism of fats, proteins and carbohydrates to maintain blood sugar glucose within a narrow optimal range and keep it in there even under stressful conditions.

The innermost zone is the zona reticularis where androgens are produced. This zone produces ancillary portions of sex hormones for males and females, to add to those primarily produced by the gonads (ovaries and testes).

There is also considered to be a fourth zone, known as the interface zone, located between the zona fasciculata and the zona reticularis. It is now thought that this interface zone is the actual site of production of most sex hormones, including estrogen and testosterone.

The adrenal glands and those four zones collectively produce over fifty hormones. The majority of those are intermediary hormones to help form other adrenal hormones, and only about a dozen of these hormones end up in circulation around the body.

Cortisol



It is the hypothalamus of the brain that influences both portions of the adrenal gland. The secretion of glucocorticoids from the adrenal cortex is regulated by negative feedback involving the corticotrophin releasing hormone (CRH) secretion by the hypothalamus. CRH then acts on the anterior pituitary to stimulate adrenocorticotrophic hormone (ACTH) secretion, which then stimulates the adrenal cortex into cortisol secretion. Although cortisol is secreted by the zona fasciculata in the adrenal glands, it is regulated primarily from the brain.

Many consider cortisol to be a 'bad' hormone and that it should be always suppressed – this isn't correct. Cortisol is responsible for many of the life sustaining functions attributed to the adrenal glands. Furthermore, many of the symptoms associated with adrenal fatigue occur from decreased levels of cortisol in the blood or inadequate levels during times of high stress. It therefore plays a big role in a lot of things.

Cortisol is known as the stress hormone because the body releases cortisol in order to help cope with stressful situations – we do actually need it. The immediate effects of cortisol are increased levels of fatty

acids, proteins and glucose in the blood.

It is a catabolic hormone, it takes protein from muscles, fatty acids from fatty tissues, it increases gluconeogenesis (the process of making glucose), and decreases the body's uses of glucose.

The amount of cortisol circulating the brain at any particular time is regulated by an integrated series of reactions between the hypothalamus, the pituitary gland and the adrenal glands. The regulatory trio operates through a negative feedback system and is referred to as the Hypothalamus/Pituitary/Adrenal (HPA) Axis or HPA system.

The HPA Axis shows how the body is connected as a whole, and is one of the most important systems of the body to control homeostasis. The HPA Axis adjusts cortisol levels according to the needs of the body, under normal or stressed situations. This is done so via a hormone called the Adrenal Corticotrophis Hormone (ACTH), which is secreted from the pituitary gland when signaled to do so from the hypothalamus. This hormone then reaches the adrenal cortex, which triggers it to produce its various hormones.

Once this process occurs, it takes less than a minute after the initial stimulation by ACTH for newly synthesized cortisol to be circulating through your body. The concentration of the cortisol is then constantly measured in the hypothalamus.

We see peaks and troughs of cortisol levels naturally throughout the day with highest levels typically seen at 8am and the lowest between midnight and 4am.

ACTIONS OF CORTISOL

As mentioned previously cortisol plays an important part in many bodily functions including:

Blood sugar

Cortisol is necessary for maintaining blood sugar levels, as when levels are low, the adrenals produce more cortisol.

Cortisol up regulates gluconeogenesis which converts fats and protein into energy for the body.

Inflammation

Cortisol is anti-inflammatory and works effectively at reducing and preventing responses to allergies in nearly all tissues. This is why in those with autoimmune reactions or disorders, low cortisol levels are common, thus creating a higher inflammatory response in the body.

Immune system

In reaction to an autoimmune response or inflammatory reaction in the body, when blood cells are sent to defend the body and attack the invaders. Cortisol also plays an important role here as it reduces the irritation such as swelling or redness caused by the attacking white blood cells.

Cardiovascular system

Cortisol can also help regulate blood pressure through the contraction of the walls of the arteries. With high levels of cortisol in the body, the more contracted the mid sized arteries become. This increase in blood pressure also directly affects the heart, and can therefore increase the strength of contractions.

Central Nervous System

Cortisol influences behaviour, mood, excitability and these behavioural changes are a result of excessive or deficient cortisol levels.

Stress

This leads us nicely back to stress and how to manage it. The body signals the adrenals to produce cortisol in times of stress. During stress cortisol must simultaneously provide more blood glucose, mobilizing fats and proteins for reserve energy, and modify immune reactions, heartbeat, blood pressure, brain alertness and nervous system responsiveness.

Without cortisol, these processes do not occur quickly enough to help us deal with the stress and we would easily succumb to it.

When we over exhaust our system with too much chronic stress, the body responds by dampening down its response, resulting in low cortisol levels.

This is also known as adrenal fatigue, or hypoadrenia.

Nutrition And Stress

When the adrenals become fatigued, their cortisol output is diminished which results in lower levels of circulating blood cortisol. With lowered blood cortisol, the body cannot convert as much glycogen into glucose.

It's therefore common for those with adrenal fatigue to experience low blood sugar levels, as their cortisol levels are low and their demand for glucose is high due to the increased stress.

This results in hypoglycaemia, leading to increased cravings for sugar. Those with adrenal fatigue therefore are typically on a constant blood sugar rollercoaster and always looking for their next sugar fix. On top of this, they rely on stimulants such as coffee and sodas to see them throughout the day.

Hypoglycaemia also causes overeating, as the body constantly strives for homeostasis to balance blood sugar levels. As we know, overeating generally leads to weight gain.

It is important for those suffering from adrenal fatigue to therefore eat regularly with consistent meal timings throughout the day. The goal should be to never go hypoglycaemic.

Furthermore, these meals should be nutritionally balanced with adequate protein, fats and carbs from foods that control hypoglycaemia. They should also avoid sugary foods, caffeine and alcohol that can all have a big effect on blood glucose levels.

FASTING

Fasting should never be used for those experiencing adrenal fatigue as it will call on the adrenals to produce glucocorticoids to maintain a level of blood glucose, thus resulting in further overuse of the adrenals.

HIGH CARBOHYDRATES

Carbohydrates are the body's preferred source of energy usage, and this becomes more apparent during times of stress.

To help provide the energy to support recovery from the stress, the person should be following a high carbohydrate diet.

CALORIE SURPLUS

A low calorie intake during stressful times or recovery from adrenal fatigue will only heighten the depletion of glycogen, breakdown of muscle tissue and put more demand on the adrenals.

Therefore someone should look to eat at calorie maintenance level or a slight surplus during stressful times or adrenal fatigue.

SUPPLEMENTS

Chronically elevated cortisol:

Phosphatidylserene — 2g a day in divided doses

Adaptogenic herbs — panax ginseng, rhodiola, ashwaganda, eleutherococcus

Cytokine support — resveratrol, pycnogenol, green tea extract, pine bark extract

Neurotransmitter GABA support — taurine, valerian root, passion flower, L-theanine

Chronically depressed cortisol:

Liquorice root extract — Dosages depend on the type of liquorice root extract used

Adaptogenic herbs — panax ginseng, rhodiola, ashwaganda, eleutherococcus

Cytokine support — Echinacea, astragalus, shiitake mushroom, beta-glucan, beta sitosterol

Excitatory neurotransmitter support — acetylcholine (Alpha-GPC, huperzine, galantamine), serotonin (5-HTP), tryptophan, St. John's wort

Abnormal circadian rhythm:

Acetylcholine support — Alpha GPC, huperzine, galantamine

Phosphatidylserine — 2g a day in divided doses for a minimum of 6 months

LIFESTYLE

Diet can be a factor when it comes to some people's problems with adrenal fatigue, as it is one reason for elevated stress.

Family, friends, career and money issues can all be stressful issues at times, and it's important to manage these as much as possible. Find the root cause(s) that may be adding extra stress in your own situation and then put procedures into place to reduce or eliminate these.

Remember to relax, laugh, sleep and have sex as much as possible, as these have a great effect on reducing the stress levels in the body. Reduce or eliminate the main stressors in your lifestyle and remember not to take life too seriously all the time.

Summary

Adrenal fatigue is not a popular topic in the healthcare industry and is often missed or ignored by practitioners. The truth is it is very real and does exist.

This article should help you understand adrenal fatigue and how to resolve and manage daily chronic stress.

LIFESTYLE MANAGEMENT WORKBOOK

Q1. WHAT IS SLEEP?

Q2. DESCRIBE THE IMPORTANCE AND ROLE OF THE CIRCADIAN CLOCK?

Q3. WHAT ARE THE KEY 3 FUNCTIONS SLEEP HAS ON THE HUMAN BODY?

Q4. WHAT IS NON-REM SLEEP AND WHAT ARE THE KEY STAGES OF IT?

Q5. WHAT IS REM SLEEP AND WHY IS IT AN IMPORTANT STAGE OF SLEEP?

Q6, WHAT ARE THE MOST COMMON TYPES OF SLEEPING DISORDER?

Q7. DESCRIBE SOME HABITS OR TECHNIQUES SOMEONE CAN USE TO IMPROVE SLEEP.

Q8. WHAT IS AEROBIC EXERISE?

Q9. WHAT IS ANAEROBIC EXERCISE?

Q10. DESCRIBE WHAT TRAINING 'VOLUME' AND 'INTENSITY' ARE.

Q11. WHAT ARE THE COMMON PHYSIOLOGICAL RESPONSES TO BOTH AEROBIC AND ANAEROBIC TRAINING?

Q12. WHAT ARE THE COMMON PSYCHOLOGICAL RESPONSES TO BOTH AEROBIC AND ANAEROBIC TRAINING?

Q13. WHAT IS OVERTRAINING?

Q14. DESCRIBE THE KEY ENERGY AND MACRONUTRIENT REQUIREMENTS FOR GENERAL EXERCISING CLIENTS.

Q15. WHAT KEY SUPPLEMENTS MAY BENEFIT THE GENERAL EXERCISER?

Q16. WHAT IS STRESS AND WHAT ARE THE 4 MAIN CATEGORIES OF IT?

Q17. WHAT IS 'GENERAL ADAPTATION SYNDROME (GAS)' AND WHAT ARE THE 3 KEY STAGES OF IT?

Q18. WHAT IS 'HYPOADRENIA' AND HOW IS IT CAUSED?

Q19. WHAT ARE THE ADRENAL GLANDS AND WHERE ARE THEY LOCATED IN THE BODY?

Q20. WHAT HORMONE IS RELEASED BY THE ADRENAL GLANDS IN A HEIGHTENED STATE OF STRESS, AND WHAT IS ITS ROLE?

Q21. WHAT IS CORTISOL?

Q22. WHAT IS THE HPA AXIS/SYSTEM?

Q23. WHAT ARE THE KEY ACTIONS OF CORTISOL IN MANY BODILY FUNCTIONS?

Q24. WHAT IS 'HYPOGLYCAEMIA'?

Q25. WHAT KEY NUTRITIONAL RECOMMENDATIONS SHOULD BE CONSIDERED FOR A CLIENT WITH HIGH STRESS LEVELS?

REFERENCES & FURTHER READING

THE IMPORTANCE OF SLEEP: EVERYTHING YOU NEED TO KNOW

1. www.helpguide.org
2. <http://www.ncbi.nlm.nih.gov/pubmed/25668196>
3. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656292/>
4. <http://www.nature.com/srep/2015/150203/srep08215/full/srep08215.html>

EXERCISE NUTRITION: NUTRITIONAL RECOMMENDATIONS TO MAXIMISE RESULTS

1. Skeletal Muscle Plasticity – Joseph Chromiak & Jose Antonio – Essentials of Sports Nutrition & Supplementation - ISSN
2. The Endocrinology of Resistance Exercise & Training – Kraemer et al – Essentials of Sports Nutrition & Supplementation - ISSN
3. Aspects of Overtraining – Mike Greenwood - Essentials of Sports Nutrition & Supplementation - ISSN

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