

ATHLETIC REPORT



Introduction to Your DNA Report

Your DNA is made of four compounds known as nucleotides: adenine, guanine, cytosine, and thymine, represented by the letters A, G, C, and T. Nucleotides make up the genetic code in each of your cells. On average, genetic differences of only 0.05% make every person unique. Understanding your unique DNA can give you insights about how you sleep, grow, age, and metabolize food.

What is a Gene?

Cells use **genes**, long coding strands of DNA, to make proteins. **Proteins** are the functional units in your body that keep you alive. Some proteins give cells their shape and structure. Others help cells carry out biological processes, like digesting food or carrying oxygen in your blood. Using different sequences of **A, C, T, and G** nucleotides, each gene contains the code to create different proteins – like a set of instructions.

What are SNPs?

When cells divide during tissue growth and repair, their DNA is copied so each new cell has a complete set of genes. Sometimes small mistakes, such as an A becomes a G, are made – kind of like typos. These errors result in variations in the DNA sequence at particular locations, called **Single Nucleotide Polymorphisms**, or SNPs (pronounced 'snips'). In some instances, SNPs can result in biological variation between people by changing the protein recipes of their genes. Some SNPs result in notable differences in health, wellness, or physical appearance, but most SNPs do not lead to observable differences at all.

How to Interpret Results

GENES + ENVIRONMENT = YOU

Your observable traits, also known as **phenotypes**, result from interactions between your genes and the environment. There are, however, differences in some phenotypes that are mainly influenced by your genes, like height. If you have short parents, you probably don't tower over your peers – though environmental factors, like a healthy diet, might give you a little lift. This is why we stress that your genetics are just one factor that makes you an individual.

Are there 'bad' SNPs?

Genetic variation should not be thought of as good or bad. As many factors – both environmental and genetic – contribute to any given trait, the key is to know which form of a gene you carry so that you can make the right lifestyle choices for your desired outcome.

Reading Your Report

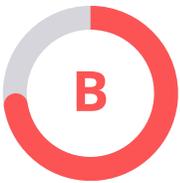
When interpreting your results, remember that information from your DNA can be challenging to interpret and this should not, under any circumstances, be considered in isolation or as a definitive diagnosis. The contribution of one genetic marker only represents a small percentage of the factors that influence a given trait. For some individuals, this small percentage may be enough to result in an observable difference. The research underpinning gene-trait associations is in its infancy and this bank of information is constantly growing. Consider the confidence grade of each marker to get an idea of the research being done. You may wish to consult a medical professional with your results to consider your environment in conjunction with your genetics for a more holistic picture of your health. In most cases, the reported outcomes represent a normal range of human physiology and do not represent abnormal, deficient, or disease traits.

Confidence Grading Criteria



Grade A

- The gene-trait association has been tested at least three times in independent studies of more than 1,000 individuals.
- At least one study has contrasted findings among multiple ethnic groups.



Grade B

- The gene-trait association has been thoroughly studied but may have some shortcomings, including fewer than three studies, small population sizes (300-1,000 individuals), or no replication in multiple ethnicities.



Grade C

- The gene-trait association has been observed in one or two preliminary studies. Often with smaller populations of a single ethnicity, these results may be of interest but have not been as rigorously studied as Grade A markers.

Your Take Action Icons

Throughout your report you will find **Take Action Icons**. These will help you understand what actions you can take for each of your genetic variants.



Your genetic variant does not influence this trait. The lifestyle choices you make on a daily basis will have the most influence on this trait.



Your genetic variant makes it easier for you to optimize this trait or, if you have other priorities, to maintain this trait while giving more attention to others.



Your genetic variant is linked to increased risks. Be mindful of how your lifestyle can impact these traits and use these opportunities to reduce your risk.



Your genetic variant slows the progression of this trait, meaning that you need to listen to your body and give it more time to recover.



You may find that it is easier to get up in the morning, refreshed and ready for the day.



Your energy levels may remain high long after the sun goes down, but you may need more time in the morning to get moving.



This trait can be optimized by many lifestyle choices and changes. Follow the recommendations suggested for this trait to find the best outcome for you!



Your variant is linked to slower or less efficient processes in your body. You can offset this by increasing your intake of various nutrients.



Your variant is linked to faster or more efficient processes in your body.

Overview of Your Report

Training Response: Endurance

Trait	Your Outcome	Icon	Recommendation
Lactate Threshold Trainability	Normal lactate threshold trainability.		Allow time to train your lactate threshold.
Energy Metabolism and Endurance	Improved aerobic metabolism.		Re-prioritize your training to focus on non-endurance skills.
Endurance Ability	No genetic contribution to endurance ability.		Accelerate recovery from heavy endurance training by supplementing your diet with N-acetylcysteine.
Endurance Performance	Endurance-oriented strengths.		Prime your aerobic metabolism with pre-workout warm-ups.

Training Response: Power vs. Endurance

Trait	Your Outcome	Icon	Recommendation
Power vs. Endurance	Improved endurance performance.		Bear in mind that you may develop your aerobic performance faster than your connective tissues adapt. Be mindful of injury risk.
Endurance vs. Power	Mix of power and endurance strengths.		If developing speed and power is your focus, try supplementing with creatine.

Training Response: Strength & Hypertrophy

Trait	Your Outcome	Icon	Recommendation
Muscle Strength	Moderately increased muscle strength.		Know what is 'strong enough' and consider investing your training time into other capacities.
Muscle Growth	No muscle growth advantage.		Ensure you achieve a regular protein intake of 1.2-2.0 g/kg daily.



Overview of Your Report *(continued)*

Training Response: Speed & Power

Trait	Your Outcome	Icon	Recommendation
Power Performance	Power and sprint strengths.		Try supplementing your diet with creatine and beta alanine.
Sprint and Power Performance	Lower ratio of power-oriented muscle fibers.		Experiment with longer inter-session rest periods, you may require more recovery.
Oxygen Delivery	No genetic contribution to power ability.		Use blood flow restriction training to increase your resistance to fatigue.
Power Performance	Power-oriented strengths.		Focus on optimizing technique for further improvements in power and speed ability.

Other Training Influencers

Trait	Your Outcome	Icon	Recommendation
Heart Rate Trainability	No genetic contribution to heart rate trainability.		Allocate sufficient training time to reach your heart rate goals.
Body Temperature	Increased body temperature during exercise.		Train in cooler environments, indoors or in the evening.
Caffeine Sensitivity	Increased caffeine sensitivity.		Consume low caffeine drinks or supplements for energy gains.



Overview of Your Report *(continued)*

Injury Risks

Trait	Your Outcome	Icon	Recommendation
Tendon Injury	No impact on tendon injury risk.		Minimise excessive torsion around tendons that can lead to cumulative wear and injury.
Ligament Injury	Increased risk of ligament injury.		Strengthen joint supporting muscles and avoid using poor technique under load.
Tendon and Ligament Injury Risk	Increased risk of tendon and ligament injury.		Try blood flow restriction, manual therapy, and be sure to warm up/cool down.
Disc Degeneration	Average risk of lumbar disc degeneration.		Focus on spinal health: try to stand or be active during the day and reduce your amount of time spent sitting.
Fracture Risk and Bone Mineral Density	Increased fracture risk.		Weightlifting or bodyweight exercises load your bones and can help improve bone and joint strength.
Age-Related Strength Loss	Normal age-related strength loss.		Logging the amount you lift during weight training can help identify if you are losing strength.



Overview of Your Report *(continued)*

Exercise Recovery

Trait	Your Outcome	Icon	Recommendation
Post-Exercise Soreness and Inflammation	Faster recovery and adaptation to strenuous exercise.		Experiment with higher training loads as you may recover faster.
Post-Exercise Inflammation	Moderate risk of inflammation after exercise.		You may need to allow more rest between sessions.

Sleep Hygiene

Trait	Your Outcome	Icon	Recommendation
Sleep Latency and Sleep Time	Morning person.		Consider moving some of your PM sessions to AM.
Internal Clock Adjustment	Less sleep needed to feel rested.		Try keeping a journal to chronicle your sleep, training quality and duration.
Sleep Quality	Restless sleeper.		Consider doing any soft tissue work, like stretching or massage, just before bed to unwind.
Restless Sleep	Increased risk of restless leg syndrome.		Tart cherry juice may help you to fall asleep faster.

Endocrine System

Trait	Your Outcome	Icon	Recommendation
Testosterone Levels	No influence on testosterone levels.		Ensure that you manage external stressors.
Cortisol Levels	Higher cortisol response to physical activity.		Control stress by following a strict schedule.



Overview of Your Report (continued)

Sports Psychology

Trait	Your Outcome	Icon	Recommendation
Motivation to Exercise	Decreased motivation to exercise.		Socialize your goals to create accountability.
Training Mentality	Increased impulsivity.		Take advantage of your eagerness to try news and keep your impulsivity in check.
Performance Under Stress	Varied focus under pressure.		Leverage your versatility in focus depending on the situation.
Error Avoidance and Novelty	No influence on novelty seeking.		Leverage your ability to grind out tough training blocks.
Pain Tolerance	You may be more sensitive to pain.		Sometimes it may be prudent to push through the pain during injury rehab.



TRAINING RESPONSE: **ENDURANCE**



Your aerobic system powers your endurance performance. Certain factors, such as mitochondrial growth, vascular function and fat oxidation influence your body's aerobic efficiency. The markers in this section impact these processes and can result in endurance strengths or areas you should focus on to improve your endurance performance.

If endurance is required for your chosen sport, but your DNA indicates this isn't a particular strength for you, increasing your aerobic workload above typical volumes may help you continue to improve your performance. There are also neuromuscular qualities that contribute to endurance performance such as muscular strength and power and working on improvements in these areas might be more cost-effective for you, depending on your DNA profile.

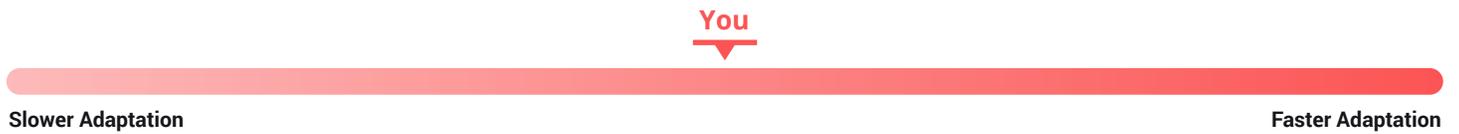


Multimarker

Lactate Threshold Trainability

Your DNA Outcome

- Your lactate threshold may adapt to training at a normal rate.



Scientific Confidence Grade



Percentage of the Population with Your Variants

46%

Recommendation

Your lactate threshold may train at a normal rate, but be sure to allow enough time in your program to reach your intended goals. If you opt for high-intensity training, be mindful of injury risk and give yourself plenty of time to recover between sessions. Include variety in your training methods to help you stay motivated.

Gene Summary

Lactate threshold is the exercise intensity at which your muscles produce more lactate than your body can get rid of. When you reach it, you may feel as though your muscles are burning, like you've 'hit a wall'. While you can train your lactate threshold so that you can push harder before the pain of exercise sets in, your genes can impact how quickly you can adapt with training.

- **PPARD** and **PPARGC1 α** influence how your muscles adapt to training and recovery through influencing mitochondrial (the energy powerhouse of your cells) density in your muscles.





Multimarker

Energy Metabolism and Endurance

Your DNA Outcome



You may have endurance strengths, an improved aerobic metabolism, and increased production of mitochondria, the cell's powerhouse.



Scientific Confidence Grade



Percentage of the Population with Your Variants

90%

Recommendation

Consider the contribution of endurance capacity to performance within your sport. If it is significant, then you may have little issue adapting to your training program. If you do not participate in endurance sports, you may not need to perform as much aerobic work as your peers to achieve similar results. Re-prioritize your training efforts to work on other contributing systems that may require more relative effort to improve.

Gene Summary

Your body adapts to endurance training in a variety of ways, like using a greater proportion of fat for fuel during extended bouts of exercise. Fat is a more efficient fuel source in comparison to sugar, which when depleted, can lead to mental and physical fatigue. Certain genes can influence how well your body uses fat to power endurance activity.

- **PPARD** and **PPARGC1a** impact fat and sugar metabolism efficiency. Studies have identified variants of these genes that are more commonly found in endurance athletes.





Multimarker

Endurance Ability

Your DNA Outcome

- No genetic contribution to endurance-oriented strengths and aerobic metabolism.

You

Normal Strengths

Endurance Strengths

Scientific Confidence Grade



Percentage of the Population with Your Variants

51%

Recommendation

NRF2 is a key regulator of glutathione, an important antioxidant. During exercise, 'free radicals' can accumulate. These molecules are generated by your cells when your cells produce energy (in the form of ATP). Free radicals can be harmful to your tissues – that's why many sources advise taking antioxidant supplements. One recent study has shown that athletes who take antioxidants such as N-acetylcysteine or hydrolyzed keratin pre-exercise may have a bump in performance during prolonged aerobic exercise. While prolonged use of antioxidant supplements is currently not recommended, these supplements can be used sparingly during heavy weeks of training and competition periods to improve performance.

As you exercise, free radicals build up within skeletal muscle. Free radicals can cause damage and impair your performance, especially over longer distances. Your body can use antioxidants to defend against acute degeneration by free radicals. Try green tea for a boost of antioxidants.

Gene Summary

Your body responds to endurance training by increasing your oxygen consumption and the density of mitochondria (the cell's powerhouse) in your cells.

- Variants of **NRF2**, are associated with higher oxygen uptake during exercise after periods of endurance training. This may be as a result of increased numbers of mitochondria in muscle cells, giving the body a greater ability to cope with the energy demand of endurance exercise.





Endurance Performance

(rs1042713) – *ADRB2*

Your DNA Outcome



You may have endurance strengths, including more efficient blood and air flow, heart performance, and lower blood pressure during periods of prolonged exercise.

You Are Genotype

AA

Scientific Confidence Grade



Percentage of the Population with AA Genotype

25%

Recommendation

You may have an increased adaptability to endurance training. Before you begin any endurance training session, prime your aerobic enzymes with a 10-15 minute continuous low-intensity warm-up.

Warming up before any workout is important! Jumping into your workout without a warm-up can result in decreased performance, marked by increased fatigue earlier in your program. Despite your endurance strengths, your aerobic system still needs time to get going.

Gene Summary

Exercise over a longer period relies heavily on your body's aerobic ability, that is, using oxygen to fuel your performance. During exercise and periods of stress, adrenaline is released and binds to the receptor produced by ***ADRB2***. This triggers adaptations that enhance endurance performance, such as the widening of your airways (bronchodilation), increased usage of glucose for energy, increased heart rate, and dilation of your arteries. Certain variants of this gene are associated with better adaptation to endurance efforts.



TRAINING RESPONSE:

POWER VS. ENDURANCE



Understanding whether you are a power or endurance orientated athlete allows you to bias your programming to reflect your unique needs. Some research has shown counter-intuitive results where power/speed outcomes can be improved via muscular endurance work and vice versa. Don't be afraid to try some unorthodox programming, the results may surprise you!



Multimarker

Power vs. Endurance

Your DNA Outcome



You may have endurance strengths.

You

Endurance Athlete

Power Athlete

Scientific Confidence Grade



Percentage of the Population with Your Variants

66%

Recommendation

Consider the relative contribution of your endurance capacity to your sport. If required, it is possible that you may adapt to aerobic training at an accelerated rate. Keep in mind that the adaptation of the connective tissues may not keep up with your accelerated performance improvements. Ensure you employ an injury monitoring system, and regularly undergo soft tissue work. Increasing muscular power has a wide range of benefits for the majority of sports. Despite your predisposition or goal, ensure to devote a portion of your training time to performing exercises such as kettle bell swings, Olympic lifting, plyometrics and sprinting (5-30 seconds).

Understanding how your DNA influences your power or endurance traits can help you to divide your time between these relative aspects of your training. You might choose to bias your training to areas of opportunity as indicated by your DNA. Take a structured approach to your training through understanding what makes you so unique.

Gene Summary

Many factors influence your endurance and power performance. Training, nutrition and your motivation can influence whether you're more suited to endurance or power performance. Your genetics can play a role too. Genes that influence how your systems adapt to the type of activities you do, whether it's power or endurance, ultimately affect your performance for longer durations or short bursts.

- **ADRB2** plays an important role in your body's metabolism and response to physical exertion. Variants of this gene are associated with either power or endurance athletes through altered cellular energy, oxygen delivery, and cardiovascular response to training.
- **HIF1 α** interacts with other genes to influence endurance performance. Its function is related to blood vessel growth, the production of new red blood cells, and how your body uses sugar for energy.





Endurance vs. Power

(rs4343) – ACE

Your DNA Outcome



You may be able to adapt to the varied demands of sports that rely on a mix of endurance and power ability. You may have a normal proportion of slow-twitch and fast-twitch muscles.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

42%

Recommendation

Given your mix of endurance and power abilities, you may have a greater degree of flexibility when planning your training program. If developing power and speed is your focus, try supplementing your diet with creatine. If your goal relates to endurance performance, try experimenting with sodium bicarbonate pre-workout.

Training to strengthen or improve specific aspects of your fitness is demanding on your body. Specialized training, focusing solely on endurance or power training may be the best option and have the best effect rather than training both on the same day.

Gene Summary

This gene is part of the system that regulates blood pressure within your arteries and fluid balance within your tissues. **ACE** has been studied in-depth in athlete groups. Certain variants are associated with endurance athletes, while others are more common in power athletes. Furthermore, people with the power athlete variant are likely to have rapid strength gains in response to training and increased left ventricular mass in their heart.



TRAINING RESPONSE:

STRENGTH & HYPERTROPHY



The ability to produce maximal force is influenced by many factors. Genetic factors can influence your ratio of fast to slow twitch muscle fibers, nutrient absorption, and resistance to muscular damage. Depending on your predispositions it may be worth experimenting with different styles of programming. Some research has shown low responders to strength training can improve their outcomes when given higher than normal training volumes. If you are a high responder you may be able re-invest your resources into capacities where you are weaker.



Multimarker Muscle Strength

Your DNA Outcome



You may experience moderately increased muscle strength.



Scientific Confidence Grade



Percentage of the Population with Your Variants

89%

Recommendation

While strength appears to be beneficial to everyone, consider its relative contribution to your sport. You may be able to get away with less relative effort training this capacity. It may be viable to re-invest your training resources elsewhere into more deterministic aspects of performance within your sport.

If you are a field sport athlete, keep in mind that heavy strength work is very taxing on the nervous system. It is important to ensure that this work is planned around practices in order to avoid the decrease in performance from heavy strength training sessions.

Gene Summary

Many factors contribute to muscle development and strength, including your diet, your proportion of fast or slow twitch muscles, how well you maintain strength as you age, and your level of activity. This panel of genes includes those that affect how well your muscles receive important nutrients, and how your muscles function and adapt to aging.

- **VDR** facilitates the absorption of active vitamin D into muscle cells.
- **CNTF** may contribute to maintaining muscle function as you age by protecting nerve cells that carry signals to muscles from aging.
- **ACTN3** influences the fast and slow twitch characteristics of muscle fibers.





Muscle Growth

(rs1805086) – MSTN

Your DNA Outcome

- You may have normal myostatin function, resulting in normal muscle growth and strength.

You Are Genotype

TT

Scientific Confidence Grade



Percentage of the Population with TT Genotype

92%

Recommendation

Maintaining a high rate of protein synthesis is crucial if your goal is to increase muscle mass. Ensure you are hitting the recommended protein intake (1.2 to 2.0 g/kg) for athletes. If you participate in a strength sport or spend a lot of time in the gym, you should be at the upper end of the intake spectrum. It may also be effective to break up your protein intake into 5-6 doses throughout

While it is best to achieve protein requirements through diet, realistically it can be tough to meal prep or plan ahead for every meal. Having a protein supplement on hand can be very convenient. If you tolerate milk products well, whey concentrates are a cost-effective source of extra protein. Whey isolate is an option for those who are more lactose sensitive.

Gene Summary

During physical activity your muscles undergo wear and tear that can result in loss of muscle strength, swelling, and soreness. The gene codes for a protein called myostatin, which helps to regulate muscle growth and repair. Myostatin tells your body when to stop producing new muscle cells. Variants of this gene are associated with increased muscle growth and strength.



TRAINING RESPONSE:
SPEED & POWER



Your speed and power ceiling is limited by your genetics, muscle morphology and anthropometrics.

Enhancements to the neuromuscular system can provide substantial benefits for most sports.

For endurance athletes, speed and power manifest in improved economy of exercise. Strength athletes can attain maximal force output more quickly. For speed and power athletes the ability to produce high amounts of force under time constraints is one of the most important attributes. The information in this section will help you set expectations around your program and assist you in prioritizing your training efforts.



Power Performance

(rs17602729) – *AMPD1*

Your DNA Outcome



You may have power and sprint strengths due to a higher ratio of power-oriented muscles.

You Are Genotype

GG

Scientific Confidence Grade



Percentage of the Population with GG Genotype

97%

Recommendation

Your variant may increase performance during exhaustive anaerobic training. To add to this advantage, consider supplementing your diet with creatine and beta alanine. Both of these products increase short-term exercise capacity.

Creatine is a safe, inexpensive, naturally-occurring compound. It helps to optimize your phosphocreatine system, which supplies you with energy for 6-10 seconds during maximal exercise. If you try taking 5 g/day for a month, you may notice an increase in your ability to perform and recover from power and strength exercises.

Gene Summary

This gene impacts your power performance by playing a key role in the energy production cycle in your muscles when oxygen is limited (anaerobic). Certain variants of *AMPD1* are associated with improved muscle strength, anaerobic performance, and force generation – all traits linked to optimal power performance.





Sprint and Power Performance

(rs1815739) – ACTN3

Your DNA Outcome



You may have a lower ratio of power-oriented muscle fibers.

You Are Genotype

TT

Scientific Confidence Grade



Percentage of the Population with TT Genotype

13%

Recommendation

Your muscular system may be less resistant to the demands of high forces, such as during jumping and sprinting. Experiment with different inter-session rest periods, and ensure that you are fully recovered before engaging in power or speed training.

Vertical jump can be a useful indicator of readiness to train. There are various wearables and apps that can provide measurements. After your warm up, perform five consecutive counter-movement vertical jumps with your hands on your hips. Calculate your average jump of the five. Track it over time along with your training load, performance and recovery indices

Gene Summary

Known as the 'sprint' gene, **ACTN3** influences how fast-twitch muscle fibers perform during high-intensity activities. Certain variants of this gene are associated with increased suitability for power and sprint performance. Experimental studies also suggest that decreased **ACTN3** activity could be linked to a decrease in strength later in life.





Oxygen Delivery

(rs11549465) – HIF1A

Your DNA Outcome

- • No beneficial impact on anaerobic metabolism and power ability.
- •

You Are Genotype

CC

Scientific Confidence Grade



Percentage of the Population with CC Genotype

89%

Recommendation

Consider using blood flow restriction training within your program. Blood flow restriction may help to increase the expression of the HIF-1a protein (the protein that this gene produces), making you more resilient to fatigue during exhaustive anaerobic training.

Blood flow restriction can be done with Voodoo bands. Simply wrap them somewhat tightly around the proximal portion of the limb. Due to lack of oxygen delivery to the tissues, you will accelerate the onset of fatigue. This can result in a potent training stimulus.

Gene Summary

This gene is more active when oxygen levels within your tissues are limited, such as during high-intensity (anaerobic) exercise, or at high altitudes. **HIF1A** regulates many other processes like glucose breakdown and transport, which in turn increase oxygen delivery and influences adaptation to low oxygen levels within your body's cells and systems. It also plays a key role in enhancing anaerobic energy production. These adaptations may increase your performance during explosive and high-intensity exercise. The aerobic system is also affected by better red blood cell production and the formation of new blood vessels around muscle tissue. These changes may help you to recover between bursts of high-intensity exercise. Certain variants of this marker have been associated with success in power sports such as weightlifting and rowing.





Power Performance

(rs1867785) – EPAS1

Your DNA Outcome



You may have power-oriented strengths, a higher ratio of fast twitch muscles and better performance in explosive activities, such as sprinting or lifting.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

50%

Recommendation

While you may have an exceptional ability to adapt to anaerobic training, technical aspects of performance are still very important. Analyzing your technical skill through video allows you to examine key positions, ensuring that you are moving as efficiently as possible.

In the gym, technique is often restricted by poor mobility. For barbell movements the culprits are usually the ankle and hip joint.

Gene Summary

This gene is involved in processes that play a key role in producing new red blood cells, the oxygen-carrying cells in your blood. **EPAS1** also plays a role in your body's response to high-intensity, anaerobic exercise, when oxygen levels are lower. Certain variants of this gene are associated with sprint or power athletes, due to differences in how your body regulates oxygen transport through your tissues.



OTHER TRAINING INFLUENCERS





Heart Rate Trainability

(rs2253206) – CREB1

Your DNA Outcome

- You may have normal heart rate trainability.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

46%

Recommendation

Various training plans can help you reach your heart rate goal. Monitor your heart rate to track your progress. If your program includes high-intensity exercise, ensure that you allocate more training time to build up the intensity incrementally and prepare yourself mentally for the extra work.

If you find that you have a better heart rate at the beginning of your training season compared to your peers, don't assume that you are ahead. Know that this baseline heart rate is different from how your heart responds to training. Being mentally prepared for the extra time it may take to reach your optimal heart rate will help you approach your training with confidence. Always measure your pulse while training to prevent overexertion, track your progress, and know when your heart rate and pace have been optimized.

Gene Summary

As you train, the muscles in your body, including your heart, become stronger and more responsive. These improvements occur due to the growth of new muscle fibers and neurons. The **CREB1** gene can impact how well your body develops and maintains cardiac muscles and how long it may take for your heart rate improve with training.





Body Temperature

(rs2253206) – CREB1

Your DNA Outcome



You may experience increased body temperature during exercise, which may be beneficial to your performance in cold environments.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

46%

Recommendation

Being too warm during training can be uncomfortable. Sometimes it's a warning sign to stop. As you may experience increased body temperature during exercise, you should aim to train in cooler environments or during the morning if you live in a warm climate. You could also try delaying your workout to until the evening to prevent heat exhaustion. Be sure to stay hydrated during your workouts and be mindful of high temperatures and remain in the shade if possible.

Knowing your body's tendencies beforehand can help you better prepare for the heat both physically and mentally. If the heat is a problem for you, consider adjusting your training location, or time of day, as well as methods of cooling down, like drinking cold water and staying in the shade. On the flip side, having a higher body temperature during exercise could be beneficial for winter training.

Gene Summary

As you exercise and your muscles work harder, your body's energy demands increase. One noticeable side effect of this is an increase in body temperature. The **CREB1** gene helps to initiate and regulate many of your body's function, including the maintenance of your core body temperature. Variants of this gene have been linked to an increased body temperature change during exercise and this might make it harder to exercise for long periods of time.





Caffeine Sensitivity

(rs762551) – CYP1A2

Your DNA Outcome



You may feel caffeine's effects stronger than others, due to decreased enzyme activity and slower caffeine breakdown.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

47%

Recommendation

Increased caffeine sensitivity can cause jitteriness. You can benefit from drinking green tea and taking a L-theanine supplement to improve your focus.

In addition to boosting your energy, caffeine helps to activate fat stores, enabling the body to use fat as its primary fuel source. This gives your body an added fuel source, in addition to sugars, enabling you to delay your fatigue time during workouts and other physical activities.

Gene Summary

The energy-stimulating effects of caffeine vary from person to person. Your genes, including **CYP1A2**, can influence how quickly your body processes caffeine. This gene is involved in breaking down caffeine in your liver and variants may influence your sensitivity to caffeine's effects by speeding up or slowing down the rate of its metabolism.



INJURY RISKS



There are multiple factors that influence injury risk, including training and physical techniques, and your genetics. Knowing how your genetic variants influence your injury risks can help you tailor your training to lower these risks with proper form and strength training. Work with your coach or trainer to manage your training plans and keep you injury-free.



Tendon Injury

(rs679620) – *MMP3*

Your DNA Outcome

- • Normal risk of tendon injury.
- •

You Are Genotype

TT

Scientific Confidence Grade



Percentage of the Population with TT Genotype

14%

Recommendation

Proper technique is critical during a workout. Tendons are designed to function in certain positions. Improper technique can put your tendons at risk of an injury. Techniques that twist or torque your tendons will add tremendous stress to where your tendons attach to your bones. Other environmental factors that will add to the risk of a tendon injury include a poor diet and poor sleeping habits.

Your tendons are amazingly strong structures, to a point. Think of them like duct tape. When you pull on it lengthwise, it is very strong, but twist it or put it under shear force and it will tear. Poor technique that puts your limbs in sub-optimal positions, paired with added physical stresses can increase your risk of experiencing a tendon injury. Your tendons are more vulnerable to tears under high sheering angles or torquing stress.

Gene Summary

This gene is an important factor in keeping your tendons healthy and influencing their growth and repair. Certain variants of *MMP3* are associated with an increased risk of Achilles 'tendinopathy', defined as inflammation, pain, and decreased function of the tendon joining heel bone to calf muscle. This gene may influence tendon injury through a reduced ability to heal and repair following strenuous exercise or trauma.





Ligament Injury

(rs1800012) – COL1A1

Your DNA Outcome



You may have an increased vulnerability to ligament injury, anterior cruciate ligament (ACL) injury, and shoulder dislocation.

You Are Genotype

CC

Scientific Confidence Grade



Percentage of the Population with CC Genotype

72%

Recommendation

The ligaments within your joints, such as your Anterior Cruciate Ligament (ACL) and Medial Collateral Ligament (MCL) within your knee can be particularly vulnerable to injury. Since you may have an increased risk of ligament injury, keeping your joints healthy is important.

Be sure to stretch before and after your workout, warm up and cool down. When training, you want your training volumes to be high, and utilize proper technique to ensure you are reducing any unnecessary strain on your ligaments. Be proactive. Recognize when your technique is getting sloppy, when you are putting strain on your ligaments and can feel pain to reduce your risk of an injury. As you may be at an increased risk, being conscious of your technique is crucial as you may not be able to get away with bad technique without consequence. Maintain a good diet and good sleep habits to further reduce your injury risk.

Your muscle strength and function is directly linked to ligament injury risk. Quick directional changes, sudden deceleration, and jumping and landing activities are common movements in many sports, but if your muscles cannot take on the strain it is transferred to your ligaments. If you are hypermobile, it is important that you don't hang off your joints. You want to focus on movement patterns that actively support your position rather than passively support it.

Gene Summary

Your ligaments are made up of different types of collagen that give them their unique stiffness and elasticity. **COL1A1** plays an important role in collagen development, and therefore, overall ligament strength and integrity. Certain variants of this gene may increase the strength of your ligaments, like your ACL and those in your shoulder, which may decrease your risk of injuries, tears and shoulder dislocation.





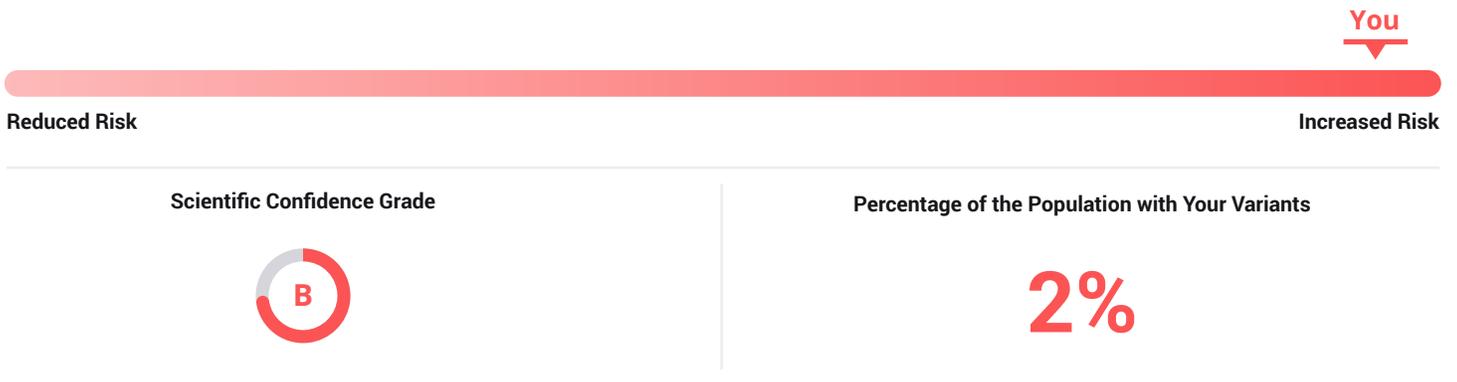
Multimarker

Tendon and Ligament Injury Risk

Your DNA Outcome



You may have an increased risk of tendon or ligament injury.



Recommendation

A proper warm-up with stretching is the key to promote blood flow to your connective tissues, as it will ensure that your body heals afterwards. Your connective tissues may recover slower than your muscles after a workout. During a workout, correct technique is crucial to avoid excess strain on your tendons and ligaments that can increase your risk of injury. Muscle strengthening, plyometrics, and exercises that improve your balance and joint mobility are all great ways to reduce your risk of tendon and ligament injuries.

Blood flow restriction training requires a rubber band, which you can wrap semi-tightly around the proximal end of joint (e.g. top of thigh). This type of training is all about creating a large metabolic response, by limiting the oxygen supply to the exercising musculature. Try going for time rather than reps, 30-40 seconds per set will probably be enough to generate some significant fatigue.

Gene Summary

The strength and resilience of your tendons and ligaments depends on their collagen content, coupled with their ability to recover from wear and tear. Various genes play important roles in keeping your tendons and ligaments healthy. Certain variants of these genes could contribute to weakened connective tissue structure or impaired blood delivery that could increase your risk of tendon or ligament injury.

- **COL12A1** influences collagen growth and development.
- **VEGFA** helps to promote connective tissue growth and health by regulating how well your body develops blood vessels in these tissues.





Disc Degeneration

(rs2073711) – *CILP*

Your DNA Outcome



You may have an average risk of lumbar disc degeneration.

You Are Genotype

GG

Scientific Confidence Grade



Percentage of the Population with GG Genotype

28%

Recommendation

Your vertebral discs should last a lifetime, but other factors, such as your family history, fatigue, your movement patterns, trunk stiffness, and your DNA can impact your disc health. Poor lifestyle choices, including an unhealthy diet and smoking, combined with sitting all day can negatively impact your susceptibility to lumbar disc degeneration, too.

Minimizing the time you spend sitting in your day-to-day life is one of the best ways to improve disc health. Strength training exercises that focus on your postural muscles (core and back), combined with low-impact physical activity such as rolling and yoga, can help eliminate the negative impacts of stressful forces on your back.

If you are getting back into training after a back injury, consider performing single leg exercises before getting back into bilateral movements such as barbell squats. Lunge variations and split squats keep your torso upright and typically require less weight.

Gene Summary

This gene is involved in maintaining the cartilage structure within your vertebral discs. Disc degeneration happens naturally with aging, although certain variants of *CILP* are associated with protection from lumbar disc degeneration and spinal soft tissue injury.





Multimarker

Fracture Risk and Bone Mineral Density

Your DNA Outcome



You may be at risk of lower bone mineral density, resulting in a higher risk of fracture.



Scientific Confidence Grade



Percentage of the Population with Your Variants

98%

Recommendation

Your DNA, nutrition and physical loading can play an important role in your risk of fracture. Calcium, vitamin D, and vitamin K are nutritional factors key in maintaining normal bone strength. If you are a high-performance athlete watch your caloric intake and that you consume sufficient amounts of these micronutrients. Eating leafy greens or supplementing your diet with sources of calcium, vitamin D, and vitamin K are easy and accessible ways to provide building blocks for your bones.

You can increase your bone density, but walking is not enough by itself to do so. Running is a suitable way to increase bone density. Strength training is not only beneficial to your muscle health, but your bone health as well. Bodyweight exercises, such as push-ups and pull-ups are a great place to start. Gradually increasing your weight over time for your workouts is a sufficient way to load your bones and reduce your risk of fracture.

Bone mineral density testing is a great way to monitor your bone strength. There are also other observable signs to monitor your bone health. For women, if you suffer from exercise-induced amenorrhea, you may want to prioritize an assessment of your bone health.

Gene Summary

Your bones are made up of minerals like calcium. The density of these minerals in your bones is known as bone mineral density. Keeping a healthy bone mineral density can protect your bones from weakness and fracture. Many factors influence your risk of lower bone mineral density and fracture risk, including genes that affect calcium and vitamin D uptake, and bone development.

- **GC** is linked to vitamin D levels, which can also have an effect on how your body uses calcium.
- **WNT16** and **SPTBN1** are both linked to bone structure and development.





Age-Related Strength Loss

(rs1800169) – *CNTF*

Your DNA Outcome

- • Normal age-related strength loss.
- •

You Are Genotype

GG

Scientific Confidence Grade



Percentage of the Population with GG Genotype

78%

Recommendation

Age-related strength loss is a natural process. Exercising and lifting weights regularly is a great way to combat this process. Weight training is an essential activity as it can help reinforce the connection between your brain and muscles in ways that lighter activity such as running or biking may not.

A strength and conditioning coach or personal trainer can help you build a weight training program unique to you to help you succeed in minimizing your strength loss. You can monitor your strength through keeping an eye on your weight lifting ability. Keeping a log of your workouts will enable you to assess whether your strength is decreasing. As you age, you may opt for heavier and slower exercises as opposed to speed exercises.

A coach or personal trainer can be a great asset to positively impact your health and longevity as you age.

Gene Summary

This gene has an effect on muscle and nerve function and may indirectly influence age-related strength loss as a result. Your nerves are the main line of communication between your brain and your muscles. As you age, you naturally lose nerve cells, which can weaken this link and lead to decreased strength. Variants of *CNTF* may result in reduced gene activity, which can result in a more rapid decline in muscle strength as you age.



EXERCISE RECOVERY



Training is all about disrupting homeostasis – increasing the demands on your systems to keep going. The recovery period is when your body adapts the most – but the amount of recovery you'll need depends on your goals, your unique physiology and your DNA. Understanding how much recovery time you require given the training performed is crucial to planning out the meso and microcycles. There is no such thing as overtraining, just under-recovery.



Multimarker

Post-Exercise Soreness and Inflammation

Your DNA Outcome



You may experience faster recovery and adaptation to strenuous exercise.



Scientific Confidence Grade



Percentage of the Population with Your Variants

67%

Recommendation

You may recover faster than your peers. Try experimenting with higher training loads, as you may respond positively. Remember, active recovery is superior to complete rest. Try a light cycle or swim on off days.

Some athletes anecdotally report reduced muscle soreness when wearing compression garments. Consider wearing a pair of long compression tights during active recovery sessions.

Gene Summary

Your body activates many repair processes following exercise that work simultaneously to repair and rebuild your muscles. During this time, your muscles can be inflamed and more vulnerable to injury. Various genes can influence the level of strength loss, muscle soreness, and inflammation after exercise. Ultimately, these factors influence how long it takes to recover.

- **IL6** plays a critical role in your immune system by promoting and regulating inflammation.
- **IGF2** may influence tissue development and impact how well muscles repair after strenuous exercise.





Multimarker

Post-Exercise Inflammation

Your DNA Outcome



You may have a moderately increased risk of post-exercise inflammation and soreness.



Scientific Confidence Grade



Percentage of the Population with Your Variants

41%

Recommendation

You may recover slower than your peers. Try experimenting with lower training frequencies to allow a greater inter-session rest period.

Pool workouts can be an effective method of recovery for the lower body. The pressure gradient helps draw fluids up from the lower body through the lymphatic system.

Gene Summary

Post-exercise muscle inflammation is a common and frustrating condition that can increase the time you need to recover between training sessions. The pain and soreness is caused by your body's inflammatory response, which helps to remove the chemicals released during muscle damage and promote repair.

- **IL1B** helps to activate the inflammatory response and can influence the level of pain associated with inflammation.
- **IL2** helps to trigger the immune system's inflammatory response.
- **MLCK** influences the level of enzymes important for muscle contraction and can influence muscle soreness.



SLEEP HYGIENE



Consistent and deep sleep is the foundation for adaptation and performance. Your DNA can help you to understand the unique strategies that can help you optimize your rest periods for your unique physiology. The genetic markers in the following section set the foundation for personal experimentation in the pursuit of optimal recovery.



Sleep Latency and Sleep Time

(rs1801260) – *CLOCK*

Your DNA Outcome



You may be a morning person, with a normal sleep-wake pattern and normal ability to fall asleep in the evenings.

You Are Genotype

AA

Scientific Confidence Grade



Percentage of the Population with AA Genotype

43%

Recommendation

Your ability to perform may be higher in the morning. If your training schedule is flexible, consider moving some of your afternoon or evening sessions to the morning. Small changes like this can add up to large cumulative performance improvements over time.

Once you find what type of sleep pattern is optimal for you, be sure to schedule around it. Sleep must be prioritized, not sacrificed.

Gene Summary

This gene plays an important role in the regulation of your circadian rhythm (sleep-wake cycle). **CLOCK** also has a significant impact on your sleep quality. Variants of this gene have been associated with duration of sleep and whether you're a night owl or a morning person.





Internal Clock Adjustment

(rs2305160) – NPAS2

Your DNA Outcome



You may be a deep sleeper and therefore need less sleep to feel rested.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

42%

Recommendation

You may not need as much sleep to recover relative to your peers. However, keep in mind that any training stress will increase your sleep requirements. Try keeping a journal chronicling your sleep duration, quality and training performances. With this data, you can start to understand how much sleep you personally need relative to the stresses of training and your lifestyle.

Life sometimes gets us out of bed earlier than we would like. A 20-30 minute afternoon nap is a great way to make up for shorter than average sleep.

Gene Summary

This gene influences how long you sleep. While the amount of sleep you need to feel at your best is influenced by many factors, this gene has been associated with total REM sleep (deep sleep) time and the amount of sleep required to feel rested. Additionally, studies have found that mice with an inactive **NPAS2** gene sleep for a shorter duration compared to the mice with an active variant of this gene.





Sleep Quality

(rs1800629) – TNF α

Your DNA Outcome



- You may be a restless sleeper, which may contribute to fatigue during the day.
- Fatigue may contribute to decreased mood, motivation, and overall quality of your day.
- If you're sleep deprived, you may experience reduced performance in tasks that require concentration.

You Are Genotype

GG

Scientific Confidence Grade



Percentage of the Population with GG Genotype

85%

Recommendation

If you regularly perform soft tissue work to maintain your body, consider doing it just before going to sleep. Soft tissue work (like foam rolling) facilitates parasympathetic effects that allow your nervous system to unwind. This may help if you are finding it difficult to get to and stay asleep.

Grab your favourite instrument (foam roller, lacrosse ball, voodoo bands etc.) and work on your tissues for 10 minutes prior to hopping into bed.

Gene Summary

This gene plays a role in how your brain copes with fatigue and your sleep patterns. Certain variants of this gene are associated with more restless sleep and fatigue, although the exact way that this gene influences your sleep patterns and fatigue has not been fully clarified.





Restless Sleep

(rs3923809) – BTBD9

Your DNA Outcome



You may have an increased risk of restless leg syndrome, which can have a negative impact on the quality of your sleep.

You Are Genotype

AA

Scientific Confidence Grade



Percentage of the Population with AA Genotype

38%

Recommendation

If you feel that your sleep quality isn't what it could be, try drinking tart cherry juice before bed. Tart cherry juice is high in melatonin, which is responsible for making you feel drowsy late in the evening.

Tart Cherry Juice is also a potent anti-inflammatory compound. It has been shown to significantly reduce muscle soreness after strenuous exercise.

Gene Summary

Restless leg syndrome causes an uncomfortable urge to move your legs. This feeling is more common in the afternoon or when you're resting in bed. As a result, if you suffer from restless leg syndrome you're more likely to have interrupted sleep. This gene has been linked to the frequency and severity of restless leg syndrome.



ENDOCRINE SYSTEM



Your endocrine system helps to regulate all the organs in your body by producing signalling compounds called hormones. In the following section we focus on two well known hormones, testosterone and cortisol. Your DNA can influence the circulating levels of these hormones in your blood. Your endocrine system is very sensitive to changes in your environment, so take your lifestyle into account when determining next steps.



Multimarker

Testosterone Levels

Your DNA Outcome

- • Normal testosterone levels.
- •

You

Decreased Testosterone

Increased Testosterone

Scientific Confidence Grade



Percentage of the Population with Your Variants

39%

Recommendation

While you may have a normal testosterone profile, remember to support your endocrine system by managing your stress appropriately and getting enough rest. Normal testosterone levels are correlated with many indices of performance including power and strength output.

The average American sleeps about seven hours per night. Sleep experts recommend athletes should achieve a minimum of nine hours to support normal function.

Gene Summary

Testosterone is a steroidal hormone that increases muscle mass and strength. Testosterone levels vary from person to person, and this variation may have a genetic basis. Two genes that may influence testosterone levels are **FAM9B** and **SHBG**, which code for a binding protein that is involved in the transport of testosterone around the body.

- **FAM9B** and **SHBG** play important roles in how efficiently testosterone is transported throughout your body and into your cells.





Multimarker Cortisol Levels

Your DNA Outcome



You may have increased cortisol levels in response to stress and/or physical activity.



Scientific Confidence Grade



Percentage of the Population with Your Variants

99%

Recommendation

As you may be more susceptible to cortisol elevation in response to stressful events, consider implementing some stress management techniques. Following a schedule can be a useful method of compartmentalizing external stressors to specific times during the day. This practice can also help maintain regular leisure and play which is important for individuals of all ages.

Your neuroendocrine system fluctuates between states of sympathetic states of readiness and parasympathetic states of recovery. When you are not training, it is recommended that you minimize stressors to ensure your body recovers efficiently for the next session.

Gene Summary

Cortisol is a powerful hormone that is produced by your adrenal glands. Its primary role is to mobilize your body's nutritional resources in stressful situations. Cortisol can have a negative impact on sleep, mood, sex drive, bone, ligament and cardiovascular health, and athletic performance. Higher cortisol levels can potentially cause fatigue and inflammation, alongside the breakdown of muscles and increased fat storage, which can have a negative effect on athletic performance.

- **FKBP5** and **CRHR1** influence how your body responds to stress and play a role in the levels of cortisol your body releases during stressful situations.



SPORTS PSYCHOLOGY



Try to make sense of what the next section says about what you already know about yourself. Be surprised and try to understand some of the variability in here between you and your friends and how that impacts some decisions you can make. Learning your tendencies can help you to initiate discussions with your coach or your peers and start to understand athlete diversity.



Multimarker

Motivation to Exercise

Your DNA Outcome



You may have decreased motivation to exercise.

You



Scientific Confidence Grade



Percentage of the Population with Your Variants

41%

Recommendation

We all have periods of decreased motivation. In order to ensure that these periods do not negatively impact training outcomes, ensure that you set 'SMART' goals. Reminding yourself of your objectives and the roadmap to achieve them is often all it takes to snap out of an unmotivated state of mind. Setting goals properly takes time and they should be periodically updated to reflect changes in your ambition and outlook over time.

S-M-A-R-T GOALS: Specific, Measurable, Achievable, Realistic, Time-specific.

Gene Summary

Your motivation to exercise is influenced by many factors, including your genetics. Genes that might influence your desire to hit the gym include those that affect how your body releases dopamine, a brain chemical that can enhance your concentration and mood, giving you a 'rush' following a good session.

- **BDNF** and an area located between **SPATS2L** and **DNAPT6**, can make exercising a more pleasurable experience by promoting increased dopamine levels and sensitivity in the areas of your brain that relate to motivation. Other variants may have the opposite effect, meaning that you might have to put strategies in place to keep your motivation up.





Training Mentality

(rs6311) – *HTR2A*

Your DNA Outcome



You may have a tendency towards emotion-based coping strategies.

You Are Genotype

CC

Scientific Confidence Grade



Percentage of the Population with CC Genotype

31%

Recommendation

You may have a more addictive personality, leading to increased impulsivity. While this is not necessarily a problem, it could lead to you disregarding the values/needs of others around you. Pay attention to the reactions of those around you to ensure you maintain the integrity of your relationships.

If you find your motivation waning, this might be a good time to take a day off, try something new or lean on a peer for support.

Gene Summary

This gene may influence an individual's personality and sport psychology traits including training mentality. This may be due to this gene's association with serotonin, a neurotransmitter that works in your central nervous system to regulate various personality traits. This includes impulsivity and aggression. Variants of *HTR2A* may influence serotonin levels in your brain.





Performance Under Stress

(rs4680) – COMT

Your DNA Outcome

- You may have normal dopamine levels, pain threshold, vulnerability to stress, and motivation to try new
- things.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

46%

Recommendation

You may be able to adopt both narrow and broad spectrum of focus when required. Depending on your sport, you may want to enhance your ability at one or the other. For narrow focus, try drills that require accomplishing a very specific task with the addition of realistic distractions. For broad focus try drills that require assessing multiple pieces of information within a short period of time.

The 100m dash requires narrow focus while playing the quarterback position in football requires broad focus.

Gene Summary

This gene is involved in regulating your dopamine levels. Dopamine is a brain chemical, known as a neurotransmitter, that sends signals in your brain and throughout your nervous system. In your brain, it plays a major role in your motivation, controlling the release of different hormones, and your motor control. Certain variants of this gene may be less effective at regulating your dopamine levels, impacting your pain threshold, your focus under pressure, and your motivation to try new things.





Error Avoidance and Novelty

(rs1800497) – *DRD2*

Your DNA Outcome



No influence on dopamine activity and ability to avoid errors when learning new skills.

You Are Genotype

GG

Scientific Confidence Grade

A

Percentage of the Population with GG Genotype

40%

Recommendation

You may need to mix things up in your training program more often due to your need for novelty. Be creative with your programming, trying different exercises and rotating between training environments.

Always ensure that your training specifically relates to the nature of your sport.

Gene Summary

DRD2 influences how your brain responds to dopamine, a chemical released in your brain. Dopamine is released during exercise and is key to the feeling of reward you might get when you master a new skill or complete a challenging task. As a result, dopamine helps to reinforce learning during new skills, providing your brain with the reward signal that keeps you motivated. Variants of this gene may affect how your brain responds to dopamine and can influence learning and novelty-seeking behaviors.





Pain Tolerance

(rs6269) – *COMT*

Your DNA Outcome



You may be more sensitive to pain.

You Are Genotype

AG

Scientific Confidence Grade



Percentage of the Population with AG Genotype

46%

Recommendation

Your increased pain sensitivity may influence your recovery from injury. Keep this in mind during exercise based rehabilitation, it may be warranted to desensitize the injury by pushing through the pain.

Naturally, when we feel pain during movement we become more reluctant to move. However, recovery from sprains and strains requires the progressive increases in both range and loading of movement. If your injury has been lingering for a long period of time, it may be okay to push into the pain a little more. Please ensure that your rehabilitation is supervised by a trained therapist.

Gene Summary

This gene influences dopamine and noradrenaline, two brain chemicals that send signals within your brain and throughout your nervous system. Variations in dopamine and noradrenaline levels can alter how you perceive pain. Individuals with higher levels may have a higher pain tolerance. Certain variants of *COMT* may alter your levels and result in varying pain tolerance.



SCIENTIFIC DETAILS

Glossary of Terms

Allele

An allele is one of two versions of a gene. You have two alleles for each gene, one from each parent. If the two alleles are the same, the individual is homozygous for that gene. If the alleles are different, the individual is heterozygous.

Chromosome

A chromosome packages the DNA found in each cell. Chromosomes come in pairs and a normal human has 46 chromosomes, which are identified as 23 pairs. You get half of your chromosomes from your mother and half from your father.

DNA

DNA is a molecule that contains the genetic instructions used in the development and functioning of all organisms - this molecule is what makes us unique. Most of your DNA is located in the cell nucleus and almost every cell has the same DNA. To carry out the important functions that an organism needs, DNA sequences are converted into messages that are read to produce proteins.

Gene

Genes are portions of DNA that are responsible for making a particular protein through the processes of transcription and translation. Human genes contain the specific information needed to make a trait and are passed down from parents to their children.

Genome

The genome is the entire set of genetic material found in each human. In humans, the genome is made up of 23 pairs of chromosomes. More than just genes, your genome includes genetic code used by the cell to regulate how and when to read the code found in each gene.

Genotype

A genotype is made of the two alleles inherited for a particular gene. The expression of different genotypes contributes to an individual's phenotype.

Phenotype

The phenotype of an organism is the observed traits of an organism. These traits can be seen and measured, such as hair, eye colour, or athletic performance.

Proteins

Proteins are large molecules that are made of one or more chains of amino acids. Proteins perform various roles that are critical for survival. They do most of the work in cells and are required for regulating your organs and tissues as well as giving rise to phenotypes.



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