
axonova
Mike, this is your sport report
POWERED BY
24Genetics

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1. Introduction

This report is a fundamental tool for athletic activity, both amateur and professional. You will see your genetic propensity to, for example, suffer injuries, have a lower heart rate, and your capacity for muscle regeneration.

Your genes determine your athletic profile, metabolism, and even the overall benefits of exercise for your body. Thanks to the sequencing of your DNA by 24genetics, and its subsequent analysis, you can optimise your workouts, discovering what types of exercise your body is best suited for, and where you should exercise special care if you want to avoid certain injuries.

As is common in our reports, on the first pages you will find a summary, featuring icons, of each of the values analysed, which we cover in more detail in later pages.

At the end of the report you will find the Questions and Answers section.

We remind you that you should consult with health professionals before making any changes to your diet or health treatments. If you have any questions about any genetic tests, consult with health personnel who are experts in genetic diagnosis, or specialised physicians.

1.1. Frequently Asked Questions

Should I make drastic changes to my health management based on the data in this test?

No, the body responds to many factors. Our genes are certainly an important parameter, but lifestyle, exercise, diet, and many other circumstances also affect the body. Knowing yourself well will certainly help you to treat your body in the most appropriate way. And this is what these kinds of test are all about: more knowledge.

Does it all depend on my genes?

No at all, our body responds to many conditions. Our genes are certainly an important parameter. Lifestyle, sport, food, and many other circumstances influence our body. Knowing yourself certainly helps to treat our body in the most appropriate way. And this is what these genetic reports aren all about: more information.

Are all the genes analysed listed in the sections?

We include only a sample of the genes that we analyse. Some of the sections are determined by the analysis of genes that we did not indicate in the report. Our algorithms combine your genotypes from the markers analysed.

What is this report based on?

This test is based on different genetic studies that have been internationally verified and accepted by the scientific community. There are scientific reports and databases where studies are published when there is a certain level of consensus. Our genetic tests are carried out by applying these studies to your genotype information. In each section you will see some of the studies on which it is based. There are sections where more studies are used than those listed.

The information provided in this report is valid only for research, information and educational uses. It is not valid for clinical or diagnostic use.

2. Summary

Sport profile


Strength


Aerobic capacity


Cardio capacity


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Resilience

Caption:


Your analyzed genotype is favorable.


Your analyzed genotype is a little favorable.


Your analyzed genotype doesn't particularly affect you.


Your analyzed genotype is a little unfavorable.


Your analyzed genotype is unfavorable.

Muscle Profile


Muscular strength


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Muscle response to resistance training


Muscular fatigue

Caption:


Your analyzed genotype is favorable.


Your analyzed genotype is a little favorable.


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Your analyzed genotype is unfavorable.

Metabolic Profile


Global benefit of the sport in your body


Benefits of Exercise in Cholesterol


Metabolic efficiency


Benefit of Exercise in Insulin Sensitivity


Benefit of exercise in body mass index

Caption:


Your analyzed genotype is favorable.


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Injury Risk


General risk of injury


Risk of overload fracture


Risk of injury to joints


Risk of ruptured tendons and ligaments

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- Your analyzed genotype is favorable.
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Cardiovascular profile

Response of blood pressure to sports

Caption:

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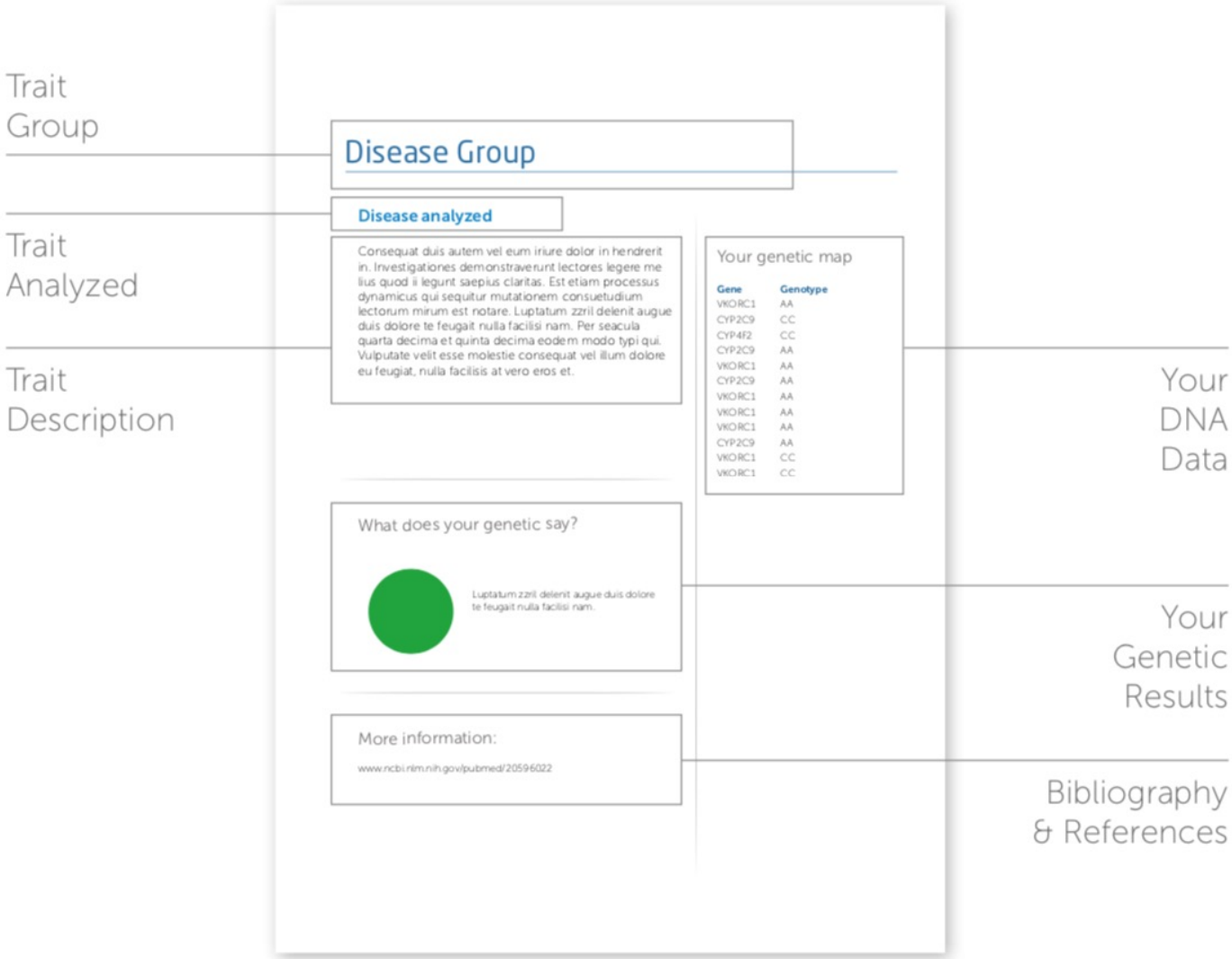
- Your analyzed genotype is unfavorable.

3. Genetic Results

3.1. How to understand your report?



3.2. Your genetic results

Sport profile

Strength

Muscle strength measures the maximum amount of force that can be exerted over a limited period of time. Rapid shrinkage fibres generate a relatively high amount of force over a short period of time. They are characterised by great strength, power and speed, but they fatigue faster. They are less able to obtain aerobic energy, lower oxygen levels, and higher levels of glycogen, so at first they get energy from glycolysis (anaerobic respiration) for muscle contraction.

This process is very fast, but it is also quite inefficient at producing energy; and it produces lactic acid, which favours muscular fatigue. This explains why fast-twitch fibres tire faster.

It is estimated that power is 80% inherited, depending on the specific type of muscle (isometric strength of the knee, hand strength, elbow flexion). To assess the power predisposition profile, genetic markers have been used that have been associated with power sports.

Your genetic map

Gene	Genotype
ACE	GG
IGF2BP2	GG
NOS3	GG
PPARG	CC
AGT	AG
PPARA	GG
VEGFA	GG
VDR	AA
PPARGC1A	TC
HIF1A	CC

What do your genetics tell us?

Your genetic predisposition to stand out in strength-related sports is low.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2658665/

Sport profile

Resistance

Resistance training is defined as a low-intensity activity performed over a long period of time. Muscle endurance measures your ability to sustain an activity for a time period without feeling tired.

If your muscular structure favours endurance, you have the potential to thrive at sports that depend on this ability. The intrinsic ability to perform resistance exercise is influenced by several factors. First, resistance depends on the proportion of slow-twitch fibres of skeletal muscle. These are also known as red fibres because they contain more myoglobin, a protein that stores oxygen, and they have their own energy source, so they can maintain their strength longer. Second, it has been observed that the top athletes usually have what have been called "marathon genes".

Studies have identified genetic variants associated with a high proportion of these fibres and a high supply of oxygen to muscle tissue.

Your genetic map

Gene	Genotype
PPARGC1A	TC
ACE	GG
NFIA-AS2	GG
HIF1A	CC

What do your genetics tell us?

Your genetic predisposition for endurance sports is intermediate.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/15705733

Sport profile

Aerobic capacity

Maximum aerobic capacity (or maximum volume of oxygen, VO2max) is the maximum volume of oxygen a athlete's muscles can use for one minute to produce maximum physical effort. This measure reflects the person's aerobic physical condition and determines their power during prolonged exercise. The benefits of having good aerobic fitness are low pressure, low cholesterol, and reduced risk of obesity, type-2 diabetes and cardiovascular disease. VO2max is measured in L/min, but is more commonly expressed in mL of O2/kg/min in order to equitably compare athletes whose body masses are different. Absolute VO2max figures are usually 40-60% higher in men than in women.

Beginning at age 30 lung capacity begins to decline, and at age 50 may be half of what it was. This decrease means that less oxygen enters our cells, leading to reduced respiration and endurance, and increased susceptibility to respiratory diseases with age. Numerous genetic variants have been associated with aerobic capacity.

Your genetic map

Gene	Genotype
NFIA-AS2	GG
RGS18	AG
ACSL1	AG

What do your genetics tell us?

Your genetics predispose you to great lung capacity.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4314597/

Sport profile

Response to Strength training

With regards to physical condition, we will define strength as the capacity to overcome resistance through the contraction produced by muscles; that is, their capacity to perform a physical task.

The quality of strength is determined by the muscular structure itself: it depends on the orientation and types of muscle fibres, the length of the muscle, and temperature: muscle contraction is more rapid and potent when the internal temperature is slightly higher than normal; and by the osteoarticular system: strength depends on the type of lever that makes the movement; and, finally, age and gender. Training is another important factor because it improves the factors that impact muscular strength: metabolism and fuel deposits that increase muscle fibre thickness, the number of myofibrils, and a delay in the appearance of muscle fatigue.

In addition, genetic factors have been associated with greater benefits in the form of increased strength after training.

Your genetic map

Gene	Genotype
INSIG2	CG

What do your genetics tell us?

Strength training is less beneficial for people with your genotype, as you are likely to gain fat mass. Moderate training is recommended.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/19105843

Sport profile

Cardio capacity

The cardiac function has a direct impact on exercise and vice versa. Scientists have shown that regular exercise increases cardiac capacity and strengthens the heart.

This capacity is measured as heart rate: the times that the heart performs the complete cycle of filling and emptying its chambers in a certain period of time. Cardiac capacity decreases with age, so it is especially important to maintain and monitor heart health.

Some people are carriers of genes that endow them with better cardiac capacity, giving them more power and strength during exercise.

Your genetic map

Gene	Genotype
NPY	TT
NOS3	CC
ADRB1	CC
APOE	TT
APOE	TC

What do your genetics tell us?

Your profile, in terms of cardiac capacity, is intermediate.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/11701704

Sport profile

Resilience

Prolonged exercise involves muscle lengthening and may result in structural muscle disruption, deterioration of the excitation-contraction process, inflammation, and the breakdown of muscle proteins.

This process is known as exercise-induced muscle damage, and although a certain amount of muscle damage is required for adaptation to occur, excessive damage or inadequate recovery from muscle damage may increase the risk of injury.

After performing physical exercise, some people recover quickly and are ready to make a physical effort again after a brief rest. Other people do not recover as quickly, and need more rest time. Research has shown that certain genetic variants are associated with slower recovery after hard exercise. People with these markers should take special care with their training plan.

Your genetic map

Gene	Genotype
IL6	GG
CRP	CC
SOD2	GG

What do your genetics tell us?

Your genotype is associated with high levels of inflammation and low levels of antioxidants, which predisposes you to slower recovery after exercise.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4983298/

Muscle Profile

Muscular strength

Muscle strength is the amount of force a muscle can exert in a single contraction. Muscles have two types of fibres: fast and slow. Fast-twitch fibres provide explosive energy; to lift weights, or run fast, for example. Slow-twitch fibres are for more endurance-related exercises.

Developing fast-twitch fibres requires aerobic activity, whereas for the development of slow-twitch fibres anaerobic exercise is required, to gain strength. Muscle strength is determined by fast fibres. which provide rapid explosions of energy.

Studies with relatives have shown that up to 90% of the variation in muscle mass, and up to 60% of variation in muscle strength, are heritable. Genetic variations have been associated with muscle strength.

Your genetic map

Gene	Genotype
HFE	CC
IGF1	AG
HIF1A	CC
GDF8	TT
IGF1	TC
SLC30A8	TC
CCL2	AA

What do your genetics tell us?

You do not enjoy an extra benefit in terms of a tendency to greater strength and muscle mass.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4696732/

Muscle Profile

Muscle response to resistance training

Workouts featuring resistance training are recommended at least two days a week. Systematic, long-term resistance training increases skeletal muscle size and strength in men and women of different ages, as well as the aerobic capacity of fast-twitch fibres.

There are studies that show that almost all people benefit from endurance exercises, although gains in muscle size and strength are highly variable amongst individuals, and depend on gender, age, general health, nutrition and personal genetics.

Several studies have reported an association between certain genetic variations and muscle size and strength. Some people gain more strength and muscle size in response to the same training as others.

Your genetic map

Gene	Genotype
BMP2	AA
IL15RA	TC
INSIG2	CG

What do your genetics tell us?

Your genotype is not associated with easier gains in muscle strength.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147943/

Muscle Profile

Skeletal Muscle Performance

Muscles such as biceps, pectorals and quadriceps are skeletal muscles that are attached to the skeleton to generate movement. Skeletal muscle is composed of elongated, thin cells, which include all the organelles necessary for cellular functions. More than 90% of the total volume of skeletal muscle cells is composed of muscle proteins, including actin and myosin contractile proteins.

When a muscle cell is activated by a nerve impulse, the interaction between actin and myosin generates a contraction. The total force depends on the sum of all the contractions that occur simultaneously in a muscle cell. Skeletal muscle is one of the three main types of muscles, the others being the heart and smooth muscle. The UCP2 and UCP3 proteins can negatively regulate mitochondrial ATP synthesis (energy that muscles use), thereby influencing physical performance. One study has found that genetic variants in these genes are associated with improved skeletal muscle performance through training.

Your genetic map

Gene	Genotype
UCP2	TC

What do your genetics tell us?

You present an increase in the efficiency of muscle contraction through training.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3330832/

Muscle Profile

Muscular fatigue

Muscle fatigue occurs when muscles cannot exert normal strength, or when it takes more effort than normal to achieve a desired level of strength. Late-onset muscle pain describes a phenomenon of muscle pain or stiffness that is felt 12-48 h after exercise, particularly when starting a new training program, after a change in sports activity, or after a considerable increase in the duration or intensity of exercise.

The proteins of an injured muscle are released into the blood. A higher concentration of these proteins means greater damage to muscle fibres and a greater likelihood of muscle fatigue.

In addition to exercise, genetic condition is another cause of muscle fatigue. There are studies that relate certain genetic variants with enhanced resistance to muscular fatigue.

Your genetic map

Gene	Genotype
HNF4A	GG
NAT2	AG

What do your genetics tell us?

The likelihood of your muscles suffering damage and fatigue is average.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/19406499

Muscle Profile

Muscle regeneration capacity

Muscles are important for exercise and, after it, need between 24 and 48 hours to repair and rebuild. Making them work again too soon simply leads to tissue breakdown.

Are you one of those people who needs a lot of time to recover after muscle damage? Prolonged and tiring exercise, such as high-intensity training, activates inflammatory factors. Genetic variations in several genes improve the inflammatory response that allows for the slow repair of muscle damage after exercise.

A person with a high predisposition to inflammation will benefit from less frequent exercise and longer recovery periods. If the body is not fully recovered, it can suffer damage due to overexertion and excessive training. This is particularly important for high-intensity athletes and bodybuilders.

Your genetic map

Gene	Genotype
IL1B	GG
IL1B	AA

What do your genetics tell us?

Based on your genotype, your muscle regeneration capacity is low. Therefore, you will need longer recovery periods.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1665272/

Metabolic Profile

Global benefit of the sport in your body

The benefits of exercise and regular physical activity are well known, and all people, regardless of age, sex or physical ability can notice its benefits. Exercise can prevent weight gain and help prevent many health problems, such as heart attacks, metabolic syndrome, type-2 diabetes, depression, various cancers, and arthritis.

Exercise releases oxygen and nutrients to tissues and helps the cardiovascular system work more efficiently. When the heart and lungs are healthier, the body has more energy.

Some people experience the benefits of exercise more quickly than others, but may also require dietary changes. People with certain genetic variants experience rapid results, such as lower cholesterol, triglycerides and blood pressure.

Your genetic map

Gene	Genotype
CETP	CC
BDNF	CC

What do your genetics tell us?

The benefits from exercise you will experience are those noted by the general population.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/21252145

Metabolic Profile

Benefit of Exercise in Insulin Sensitivity

Insulin helps control changes in glucose levels (commonly known as sugar) in the body. Insulin sensitivity refers to the body's ability to respond to these changes.

Having a greater sensitivity to insulin means that the body is better able to process glucose. Insulin resistance, on the other hand, is an alteration that impedes the proper regulation of glucose, and is associated with obesity and type-2 diabetes. Many people can benefit from exercise to increase insulin sensitivity.

According to one study, people with the beneficial genotype in a marker of the LIPC gene benefit more in the form of increased insulin sensitivity.

Your genetic map

Gene	Genotype
LIPC	TC

What do your genetics tell us?

You enjoy increased benefits from exercise in the form of better insulin sensitivity. This is especially important if you are diabetic, are overweight, or have a metabolic syndrome.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/15983229

Metabolic Profile

Benefits of Exercise in Cholesterol

One of the benefits of exercise is improved cholesterol levels. HDL cholesterol is known as good cholesterol, and having high levels of HDL is beneficial. Many people can improve their HDL levels through exercise.

Research has shown that exercise stimulates enzymes that help move bad cholesterol from the blood to the liver, allowing it to be excreted with bile. It has also been stipulated that exercise increases the size of protein particles that carry cholesterol through the blood, reducing the possibility that small particles clog arteries.

Individuals with certain genetic variants will do well to increase their good cholesterol levels while exercising, while carriers of other genetic variants are less likely to lower their bad cholesterol levels through exercise alone.

Your genetic map

Gene	Genotype
CETP	CC
PPARD	TT

What do your genetics tell us?

Your genotype is not associated with a greater capacity to regulate your cholesterol levels through exercise.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/21252145

Metabolic Profile

Benefit of exercise in body mass index

Exercise is part of weight loss plans, and is a crucial tool for maintaining a healthy weight. Physical activity is beneficial for all people, regardless of their genetics, but exercise is especially recommended for people at increased risk of being overweight.

People with a certain variant in the genetic marker of the FTO gene are more likely to be overweight, have an increased Body Mass Index, and waist circumference. However, a large-scale study has shown that genetic susceptibility to obesity-induced variants in the FTO gene can be changed by adopting an active lifestyle.

In fact, people who are more susceptible to obesity experience greater weight loss by exercising at moderate intensities.

Your genetic map

Gene	Genotype
FTO	GG
FTO	CC

What do your genetics tell us?

Your genotype is not associated with easier weight loss through exercise.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/19553294

Metabolic Profile

Metabolic efficiency

Metabolism refers to the chemical processes that the body undergoes to convert food into energy, and a concept related to the way in which each body uses nutrients.

Physical fitness is a very complex phenotype, influenced by numerous genetic and environmental factors that contribute to inter-individual variation. Sports genomics studies the genetic components that determine sports performance.

Variations in various genes play an important role in how bodies respond to different types of physical activity, as these genes have a physiological impact on sports performance. Some genes analysed are involved in the metabolism of fatty acids whose expression can improve the oxidative capacity of skeletal muscle during exercise; i.e. different variants result in a more or less efficient acquisition of energy from fatty acids and other nutrients.

Your genetic map

Gene	Genotype
AMPD1	GG
PPARA	GG
ADRB2	GG
PPARD	TT
PPARGC1A	TC

What do your genetics tell us?

The efficiency of your metabolism is intermediate, according to your genetic results.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/20044476

Injury Risk

General risk of injury

Exercise has numerous health benefits, but we must be careful to avoid injuries that occur when we perform exercises incorrectly. Although injury is always a risk when we engage in any exercise, some people are more likely to injure themselves than others, in part due to their genetics.

Scientific evidence has shown that certain genetic variations can affect vulnerability to injury. People at increased risk should adjust their training plans.

The genetic risk of injury is calculated taking into account variations in the genes related to general inflammation, as when suffering from soft tissue injuries, inflammation levels may affect recovery. This information allows you to get recommendations about which exercises to do and which to avoid.

Your genetic map

Gene	Genotype
GDF5	GG
COL1A1	AC
IL6	GG
CRP	CC

What do your genetics tell us?

Your genetic characteristics make you moderately vulnerable to tendon, ligament and muscle injuries.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/20360039

Injury Risk

Risk of injury to joints

Many sports-related injuries involve joint damage. The most common are wrist or ankle sprains, excessive elbow extension, and damage to the knee ligaments.

When exercising you are at higher risk of injury from the excessive use of joints, but you can strengthen and avoid injury by doing the exercise correctly, and stretching. Risk of joint damage is associated with an increased genetic predisposition to osteoarthritis.

Knowing personal risk is important to adjust the duration and intensity of one's training sessions. Sports and high-impact activities can lead to cartilage injuries and damage to the joints. Your risk of injury is calculated based on genetic variations that are associated with joint problems.

Your genetic map

Gene	Genotype
GNL3	AG
FTO	TT
SUPT3H	AA
IL1A	GG

What do your genetics tell us?

You are not prone to joint injuries.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/22763110

Injury Risk

Risk of overload fracture

Overload fractures are small cracks in the bone caused by repetitive force or repetitive movements, such as running long distances or jumping repeatedly. They can also be caused by normal use of a weakened bone.

Anyone can suffer an overload fracture, but some people have a greater predisposition, which is associated with lower bone density. Overload fractured are a common injury in athletes, and affect up to 20% of athletes, particularly women. The main factor affecting one's risk to overload fractures is bone density, which has a genetic component (up to 85% of the variability is explained by genetic variations).

Using information from various genetic variants, the risk of overload fractures is estimated. Some variations increase risk while playing a protective role.

Your genetic map

Gene	Genotype
FUBP3	AG
RIN3	CC
C17ORF53	AA
MEPE	TT
ZBTB40	GG

What do your genetics tell us?

You are at a high risk of stress fractures.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/24945404

Injury Risk

Risk of ruptured tendons and ligaments

Ligaments are designed to stabilise the joints. Strong tendons and ligaments minimise injuries, although overuse induces changes that make them vulnerable.

Anterior Cruciate Ligament (ACL) tears are one of the most severe injuries, and are very common among high-intensity athletes whose sports call for sudden deceleration, jumping, and advancing while the knee is flexed. ACL injuries usually occur along with damage to other structures of the knee, such as articular cartilage, the meniscus, or other ligaments. Achilles tendon injuries, meanwhile, are a major obstacle to any athlete's performance; they affect athletes in a wide variety of sports (up to 20% of runners) and can often take months to heal.

Individuals with favourable genetic variations may have stronger ligaments and tendons than the general population, decreasing their risk of injury. Knowing your genetic susceptibility to specific injuries will help you customise your exercise and choose prevention strategies.

Your genetic map

Gene	Genotype
COL1A1	AC
MMP3	TT
GDF5	GG
COL12A1	TT

What do your genetics tell us?

You are unlikely to suffer ligament and tendon injuries associated with sports.

More information:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5432363/

Cardiovascular profile

Response of blood pressure to sports

High blood pressure, known as hypertension, is a common health issue. It is estimated that most people will have hypertension at some point in their lives.

Exercise has been shown to lower blood pressure. In fact, aerobic training is generally recommended as a therapy to prevent, treat, and control hypertension. An hour and a half of low-intensity aerobic exercise per week helps to lower blood pressure. There is great variability in the inter-individual response to the antihypertensive effects of exercise, and much of this variation is explained by genetic predisposition.

People more prone to controlling their hypertension see their blood pressure drop more quickly than the average person. For these people the benefits of 30 minutes of exercise a day are more noticeable than for the general population.

Your genetic map

Gene	Genotype
EDN1	TG
NOS3	GG
GNAS	TC
ADD1	TG

What do your genetics tell us?

Your blood pressure decreases faster through exercise than in the rest of the population.

More information:

https://www.ncbi.nlm.nih.gov/pubmed/17938376

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