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by SPORTOTEAM



YOUTH & GROWTH

Growth, Development & Sports Predisposition

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YOUTH & GROWTH

— Growth, Development and Athletic Predisposition

A plain-language look at your genetic tendencies in growth, development, nutrition, athletic predisposition, recovery and connective tissue — written to be read alongside your age, stage of development and daily life.

◎ ABOUT THIS REPORT

Genes do not decide how tall you will be, how good an athlete you will become or which sport suits you; they only shape the playing field. Each item below explains in everyday language what your own result means, then what research has found.

Every result is written the same way: first what the gene does, then what your version means. Every source used is listed at the end of the report, so each statement here can be traced to its study. Grades from 1–5 show how strong the reported effect is for your version; they do not show how serious a disease risk is or how good the science is. Three stars is the most common result and completely normal.

≋ TEST PLATFORM

This report uses the Illumina Global Screening Array v3 / v4 (GSA) platform, a genome-wide chip that reads hundreds of thousands of single-letter DNA differences. Every marker here was checked against Illumina's official marker lists (GSA v3 'GSA-24v3-0_A2', genome build GRCh38, and the GSA v4 Enhanced PGx rsID list), so each returns a plain letter result (A/T/C/G). One exception is noted where relevant: 'rs12722' (COL5A1) is on v3 but not on the v4 list.

👤 ATHLETE INFORMATION

SAMPLE BARCODE	**GSA-2026-09-0431-A**	REPORT NO	**RPT-YOUTH-2026-0431**
PANEL	**Illumina GSA v3 / v4 — YOUTH & GROWTH**	ATHLETE	**Sample Athlete**
SPORT	**Basketball**	AGE / SEX	**12 y 4 m / Male**
HEIGHT / WEIGHT AT SAMPLING	**148 cm / 42 kg**	ANCESTRY GROUP	**Europe**
SAMPLE TYPE	**Buccal swab**	SAMPLING DATE	**2026-09-04**
ANALYSIS DATE	**2026-09-15**	REPORT DATE	**2026-09-18**

⚗ PANEL SUMMARY

TOTAL GENETIC PROFILE
10

DISTINCT DNA VARIANTS ANALYSED
48

CATEGORIES COVERED
4

TWO ASSESSMENT AREAS
Growth and development · Athletic genetic predisposition

ⓘ This report translates genetic markers into personal training, recovery and nutrition context. Use it with your coach, trainer or dietitian to fine-tune your daily choices.

Domain *Overview*

Each profile is scored on a 1–5 scale by how strongly your genotype affects the trait.

GROWTH AND DEVELOPMENT

01 **Growth Hormone and IGF-1 Axis**



02 **Growth Plate and Height Tendency**



03 **Bone Formation and Bone Strength**



04 **Puberty Timing and Maturation**



NUTRITION DURING GROWTH

05 **Vitamin D, Calcium and Bone Nutrition**



06 **Micronutrients, Iron and Fuel Use**



ATHLETIC GENETIC PREDISPOSITION

07 **Power and Endurance Predisposition**



08 **Oxygen Transport and Vascular Response**



RECOVERY AND RESILIENCE

09 **Recovery, Inflammation and Sleep**



10 **Injury and Connective Tissue**



01. Growth Hormone and IGF-1 Axis

The message chain that drives childhood growth: growth hormone leaves the pituitary gland, tells the liver to make IGF-1, and IGF-1 tells the growth plates to keep making new bone.

RS	GENE	GENOTYPE	GRADE
rs35767	**IGF1**	CT	
rs11977526	**IGFBP3**	GG	
rs4290270	**GHR**	TT	
rs7759938	**LIN28B**	TT	
rs6440003	**ZBTB38**	AG	

✧ rs35767 — IGF1 Genotype: CT

WHAT DOES YOUR GENE DO?

This gene makes IGF-1, the main growth messenger in the blood. It tells cartilage cells in the growth plates to divide and muscle cells to grow; it is the single busiest signal of childhood growth.

WHAT DOES YOUR RESULT MEAN?

You carry CT: one copy of the version linked to slightly more IGF-1 in the blood. IGF-1 is the messenger that tells your bones to keep building. This means your growth signal is average or slightly above for your age. This is one of the few steps in the growth chain a routine blood test can actually measure, so if the family wishes, a doctor can compare your result with a real value.

✧ rs11977526 — IGFBP3 Genotype: GG

WHAT DOES YOUR GENE DO?

This gene makes the carrier protein that transports IGF-1 in the bloodstream. Bound IGF-1 is stored and protected; free IGF-1 is what actually reaches tissue. So the carrier sets how much of the signal is available at any moment.

WHAT DOES YOUR RESULT MEAN?

You carry GG: the version linked to a normal amount of the protein that carries IGF-1 in your blood. IGF-1 does not circulate freely; only the part released from its carrier reaches your bones. This is the delivery side of your growth system, and it works in the usual way for you. Studies of this position mostly concern why blood levels differ from person to person, not an unusual condition.

✧ rs4290270 — GHR Genotype: TT

WHAT DOES YOUR GENE DO?

This gene makes the 'docking station' (receptor) on cells where growth hormone binds. If the receptor does not respond, the body grows slowly even when the pituitary makes plenty of hormone.

WHAT DOES YOUR RESULT MEAN?

You carry TT: the common version on both copies. This means your cells receive the growth hormone signal normally. In everyday terms, the message your body sends and the message your bones receive match as they should. This receiving step is well studied, because it must work for the rest of the chain to function.

✧ rs7759938 — LIN28B Genotype: TT

WHAT DOES YOUR GENE DO?
This gene helps set the timer for puberty. Puberty ends height growth by closing the growth plates, so anything that shifts its timing also changes how long the growth window stays open.

WHAT DOES YOUR RESULT MEAN?
You carry TT: two copies of the version linked to starting puberty slightly later than average. Since puberty is what finally closes the growth plates, a later start usually means your growth window stays open a little longer. This is one of the most replicated findings in puberty timing studies, but it shifts the schedule by months, not years.

✧ rs6440003 — ZBTB38 Genotype: AG

WHAT DOES YOUR GENE DO?
One of the strongest single common variants linked to adult height in large population studies; it affects how genes are switched on in growing cells.

WHAT DOES YOUR RESULT MEAN?
You carry AG: one copy of the version slightly more common in taller people. On its own it nudges your height tendency up by a very small amount. Height is spread across thousands of small genetic effects like this, so no test can give you an exact number.

02. Growth Plate and Height Tendency

Growth plates are cartilage discs near the ends of long bones. Cells here divide and turn into bone, and the bone lengthens. These markers describe the raw material and pace of this process.

RS	GENE	GENOTYPE	GRADE
rs1042725	**HMGA2**	CC	
rs3817428	**ACAN**	GG	
rs143384	**GDF5**	AG	

✧ rs1042725 — HMGA2 Genotype: CC

WHAT DOES YOUR GENE DO?
This gene regulates how fast cells divide in growing tissue, including growth plate cartilage. It was one of the first common variants linked to human height.

WHAT DOES YOUR RESULT MEAN?
You carry CC: two copies of the version linked to taller stature; this is the clearest height-related signal in your whole panel. It steers your overall tendency slightly up, not down. Still, the studies behind it agree that a single position shifts the picture only a little, because height comes from thousands of positions working together.

✧ rs3817428 — ACAN Genotype: GG

WHAT DOES YOUR GENE DO?
This gene makes aggrecan, the shock-absorbing protein that fills cartilage in both growth plates and joints. It is the building material of the growth plate.

WHAT DOES YOUR RESULT MEAN?
You carry GG: the usual version of one of the main building blocks of cartilage in your growth plates. This means the raw material your growth plates are made of is produced in the usual way. This gene is well known in growth research, and your result falls in the common, unremarkable group.

✧ rs143384 — GDF5 Genotype: AG

WHAT DOES YOUR GENE DO?

This gene guides how bones, joints and tendon attachment points are shaped as they form, and stays active in cartilage maintenance throughout life.

WHAT DOES YOUR RESULT MEAN?

You carry AG: one copy of each version, the result seen in most people. Your bones, joints and the points where tendons attach to bone are shaped in the typical way. This gene comes up often in joint research; a single-copy result like yours is an ordinary reading, not a notable one.

03. Bone Formation and Bone Strength

About 90% of adult bone mass is built before the early twenties. The teenage years are the only window in which training and nutrition can permanently change how strong the skeleton will be.

RS	GENE	GENOTYPE	GRADE
rs3736228	**LRP5**	CC	
rs2016266	**SP7 (Osterix)**	GG	
rs3801387	**WNT16**	AG	
rs1234612	**SOST**	CT	
rs1800012	**COL1A1**	GG	

✧ rs3736228 — LRP5 Genotype: CC

WHAT DOES YOUR GENE DO?

This gene is part of the Wnt pathway, the master switch that tells bone-building cells to get to work. It is one of the most consistently replicated effects on bone density.

WHAT DOES YOUR RESULT MEAN?

You carry CC: the more favourable version, on both copies, of the gene that helps set how dense your bones will be. This is a genuinely good result for a growing athlete: it points to well-developing bone. Research on this pathway also shows the bone it builds responds strongly to loading, and the teenage years are when bone is most 'banked'.

✧ rs2016266 — SP7 (Osterix) Genotype: GG

WHAT DOES YOUR GENE DO?

This gene is the master switch that turns an ordinary cell into a bone-building cell. Without it, cartilage never becomes true bone.

WHAT DOES YOUR RESULT MEAN?

You carry GG: the version linked to normal bone building. This gene turns an ordinary cell into a bone-building cell; your result means this conversion happens as it should while you grow. In bone biology, it is one of the clearest examples of a single gene being required for cartilage to become true bone.

✧ rs3801387 — WNT16 Genotype: AG



WHAT DOES YOUR GENE DO?

This gene mostly controls cortical bone, the dense outer shell of bone that resists fracture. It matters more for how well bone withstands an impact than for the density value.

WHAT DOES YOUR RESULT MEAN?

You carry AG: one copy of each version, giving an average tendency for the thickness of your bones' hard outer shell. This outer shell is the part that resists an actual fracture, so an average result here is a comfortable position. Researchers have found the outer shell and spongy interior are governed partly by different genes, so two people with the same bone scan can differ.

✧ rs1234612 — SOST Genotype: CT



WHAT DOES YOUR GENE DO?

This gene makes sclerostin, the brake on bone formation. Mechanical loading works partly by releasing this brake; this is the biological reason exercise strengthens bone.

WHAT DOES YOUR RESULT MEAN?

You carry CT: your body's natural brake on bone building is set at an everyday level, with no sign that bone building is held back. So, for this gene, your skeleton can respond normally as you grow. Loading the skeleton releases this brake; this is the biological reason movement and sport strengthen bone.

✧ rs1800012 — COL1A1 Genotype: GG



WHAT DOES YOUR GENE DO?

This gene makes type I collagen, the rope-like protein that gives both bone and tendon their tensile strength. Bone is essentially a collagen rope reinforced with mineral.

WHAT DOES YOUR RESULT MEAN?

You carry GG: the common version, so your body makes the main collagen of bone and tendon in the usual amount. Collagen is the rope-like material that gives both their strength, and yours is produced normally. Studies link a different, much rarer version at this position to weaker tissue; you do not carry it.

04. Puberty Timing and Maturation

Oestrogen, produced in both boys and girls, is the hormone that finally closes the growth plates. The markers here concern the timing and pace of this closure, not height itself.

RS	GENE	GENOTYPE	GRADE
rs2234693	**ESR1 (PvuII)**	CT	
rs9340799	**ESR1 (XbaI)**	AA	
rs4986938	**ESR2**	GA	
rs700518	**CYP19A1**	AG	

✧ rs2234693 — ESR1 (PvuII) Genotype: CT

WHAT DOES YOUR GENE DO?

This gene makes oestrogen receptor alpha, the 'docking station' through which oestrogen tells the growth plates to slow down and eventually close.

WHAT DOES YOUR RESULT MEAN?

You carry CT: one copy of each version; this is the most common result and is not linked to unusually early growth plate closure. For this gene, your growth plates should follow a usual schedule. This gene makes the part of the cell that receives oestrogen, the hormone that finally closes the plates in both boys and girls.

✧ rs9340799 — ESR1 (XbaI) Genotype: AA

WHAT DOES YOUR GENE DO?

The same oestrogen receptor gene, read at a second position. This position has mostly been studied for how bone responds to sex hormones during puberty.

WHAT DOES YOUR RESULT MEAN?

You carry AA: the common version, consistent with the result just above. Taken together, the two positions agree that your growth plate timing is on a usual course. These two positions are usually inherited as a pair, so the report checks them together and expects them to agree; yours do.

✧ rs4986938 — ESR2 Genotype: GA

WHAT DOES YOUR GENE DO?

This gene makes the second oestrogen receptor, the beta receptor. It plays a role in bone maturation and the final stage of growth plate closure.

WHAT DOES YOUR RESULT MEAN?

You carry GA: one copy of each version in your second type of oestrogen receptor; there is no effect pushing your growth plates to close early or late. This is another usual result for maturation timing. This receptor plays a role in bone maturation, and studies place a single-copy result like yours in the middle group.

✧ rs700518 — CYP19A1 Genotype: AG

WHAT DOES YOUR GENE DO?

This gene makes aromatase, the enzyme that converts testosterone into oestrogen. It is the tap that sets how much oestrogen reaches the growth plates.

WHAT DOES YOUR RESULT MEAN?

You carry AG, meaning everyday-level activity in the enzyme that converts testosterone to oestrogen; this fits a normal puberty timeline. This enzyme is essentially the tap controlling how much closure signal reaches your growth plates, and yours is set at the usual level. Research on rare cases where the enzyme is entirely missing shows how central this step is to when growth stops.

05. Vitamin D, Calcium and Bone Nutrition

Growth and training raise nutrient needs at the same time. Vitamin D and calcium are the two nutrients that most directly decide how much of the growth potential in the sections above is actually realised.

RS	GENE	GENOTYPE	GRADE
rs1544410	**VDR (BsmI)**	GA	
rs7975232	**VDR (TaqI)**	AC	
rs10741657	**CYP2R1**	AG	
rs2282679	**GC**	TT	
rs4988235	**LCT**	AG	

✧ rs1544410 — VDR (BsmI) Genotype: GA

WHAT DOES YOUR GENE DO?

This gene makes the vitamin D receptor, the switch vitamin D flips inside cells to boost calcium absorption in the gut and lay the mineral into bone.

WHAT DOES YOUR RESULT MEAN?

You carry GA, meaning one copy of each version of the switch vitamin D flips to move calcium from food into bone. You are neither an especially strong nor an especially weak responder, so your calcium use works in the usual way. Studies on this position note that when the result is in the middle, like yours, your blood vitamin D level tells more than genetics.

✧ rs7975232 — VDR (TaqI) Genotype: AC

WHAT DOES YOUR GENE DO?

The same vitamin D receptor gene read at a second position; reported with BsmI because the two are usually inherited together.

WHAT DOES YOUR RESULT MEAN?

You carry AC, meaning one copy of each version; this matches the vitamin D switch result above. The agreement between the two makes your usual result more reliable than a single position. These two positions almost always move together in the same gene, which is why researchers read them as a pair.

✧ rs10741657 — CYP2R1 Genotype: AG

WHAT DOES YOUR GENE DO?

This gene makes the liver enzyme that performs the first activation step of vitamin D, converting vitamin D from sunlight and food into a form the body can use.

WHAT DOES YOUR RESULT MEAN?

You carry AG, meaning one copy of the slower version of the liver enzyme that turns vitamin D into its usable form. Your body performs this step at a somewhat calmer pace rather than quickly. Studies on this position help explain why two children with the same sun exposure and the same diet can have different vitamin D levels.

✧ rs2282679 — GC Genotype: TT

WHAT DOES YOUR GENE DO?

This gene makes vitamin D binding protein, which carries vitamin D around the body. It is the strongest known common influence on measured vitamin D levels.

WHAT DOES YOUR RESULT MEAN?

You carry TT, meaning the favourable version of the carrier that transports vitamin D in your body on both copies; this is linked to higher blood levels. This is a helpful result and partly offsets the slower activation step above. Of those studied so far, this position has the largest single genetic effect on a vitamin D blood test result.

✧ rs4988235 — LCT Genotype: AG

WHAT DOES YOUR GENE DO?

This variant controls whether the lactase enzyme keeps working after early childhood, i.e. whether milk can be drunk comfortably in adulthood.

WHAT DOES YOUR RESULT MEAN?

You carry AG, meaning the version that keeps your milk-digesting enzyme working as you grow, so dairy suits you well. This matters at your age, because the teenage years are when the body lays the most calcium into bone, and dairy is its easiest daily source. This is one of the best-understood genetic differences in human nutrition.

06. Micronutrients, Iron and Fuel Use

Iron, folate, B12 and dietary fats underpin everything else. A shortfall here quietly limits both growth and training response, and needs peak during puberty.

RS	GENE	GENOTYPE	GRADE
rs1801133	**MTHFR**	CT	
rs492602	**FUT2**	AG	
rs1800562	**HFE**	GG	
rs855791	**TMPRSS6**	GA	
rs174547	**FADS1**	TT	

✧ rs1801133 — MTHFR Genotype: CT

WHAT DOES YOUR GENE DO?

This gene makes the enzyme that converts folate to its active form; active folate is used for DNA building in every dividing cell, and growing tissue divides constantly.

WHAT DOES YOUR RESULT MEAN?

You carry CT, meaning one copy of the slower version of the enzyme that processes folate, the vitamin every dividing cell uses to build DNA. Your processing runs slightly slower than the fastest version; as long as dietary folate is reasonable, this makes no practical difference for you. It is an extremely common result worldwide, and that is exactly what research finds.

✧ rs492602 — FUT2 Genotype: AG

WHAT DOES YOUR GENE DO?

This gene determines which sugars coat the gut wall, which affects vitamin B12 absorption and which bacteria settle in the gut.

WHAT DOES YOUR RESULT MEAN?

You carry AG, meaning one copy of each version; this is linked to usual use of vitamin B12. This gene changes the sugars coating your gut wall; your result means this coating is of the common type. Interestingly, the same small change affects both B12 absorption and which bacteria settle in your gut, so a single position appears in two very different research fields.

✧ rs1800562 — HFE Genotype: GG

WHAT DOES YOUR GENE DO?

This gene regulates how much iron the gut absorbs. It is the main control deciding whether the gut keeps taking in iron or slows down once the body has enough.

WHAT DOES YOUR RESULT MEAN?

You carry GG, meaning the common version on both copies, so the iron storage problem this gene is best known for does not apply to you. In practice your gut handles iron in the usual way. This is one of the most thoroughly studied positions in the genome, which makes a clear result like yours reliable.

✧ rs855791 — TMPRSS6 Genotype: GA



WHAT DOES YOUR GENE DO?

This gene fine-tunes hepcidin, the hormone that decides how much dietary iron is actually absorbed. It is one of the strongest common influences on iron status.

WHAT DOES YOUR RESULT MEAN?

You carry GA, meaning one copy of the version linked to slightly lower iron stores, at one of the strongest known genetic influences on iron levels. Your usable iron tends to run slightly below average rather than above it. Growing teenagers and endurance athletes use more iron than average; researchers usually discuss this position in that context.

✧ rs174547 — FADS1 Genotype: TT



WHAT DOES YOUR GENE DO?

This gene controls the enzyme that converts short-chain plant omega-3 fats into the long-chain forms actually used by the brain, retina and cell membranes.

WHAT DOES YOUR RESULT MEAN?

You carry TT, meaning the efficient version on both copies, so you convert plant omega-3 from foods like walnuts into the long form your brain and eyes use fairly well. This means you benefit more than many people from everyday plant sources. How well people make this conversion varies greatly, which is why research does not treat fish oil as equally important for everyone.

07. Power and Endurance Predisposition

Context on how this young athlete's body tends to produce and sustain effort. These markers never show which sport a child should play; they only describe tendency, and at this age training history matters far more.

RS	GENE	GENOTYPE	GRADE
rs1815739	**ACTN3**	CT	
rs4341	**ACE (I/D proxy)**	GC	
rs8192678	**PPARGC1A**	GG	
rs4253778	**PPARA**	GG	
rs17602729	**AMPD1**	CC	
rs1805086	**MSTN**	AA	
rs1042713	**ADRB2**	AG	

✧ rs1815739 — ACTN3 Genotype: CT

WHAT DOES YOUR GENE DO?

This gene makes alpha-actinin-3, a scaffolding protein found only in fast-twitch muscle fibres, the fibres used in sprinting, jumping and heavy lifting.

WHAT DOES YOUR RESULT MEAN?

You carry CT, meaning one 'power' copy and one 'endurance' copy; this is also the most common combination worldwide. It points to a truly mixed athletic profile rather than either extreme, which suits a sport like basketball where you must both sprint and keep going. This is the most studied gene in sports science:
it decides whether your fast fibres get a particular scaffolding protein, and the 'power' letter is more common in elite sprinters.

✧ rs4341 — ACE (I/D proxy) Genotype: GC

WHAT DOES YOUR GENE DO?

This marker stands in for the classic ACE insertion/deletion, which helps set blood pressure and how blood vessels respond to exercise, tilting the body towards endurance or power.

WHAT DOES YOUR RESULT MEAN?

You carry GC, meaning one copy of each version; there is no clear tilt towards endurance or power. Your result sits in the balanced middle group here. This gene has been studied for over twenty years in Olympic rowers, soldiers and mountaineers; the fair summary of all this work is that its effect is real but small.

✧ rs8192678 — PPARGC1A Genotype: GG

WHAT DOES YOUR GENE DO?

This gene tells muscle cells to build more mitochondria, the tiny power plants that make energy for anything lasting longer than a few seconds.

WHAT DOES YOUR RESULT MEAN?

You carry GG, meaning two copies of the favourable version found more often in athletes with unusually good endurance. This gene tells your muscle cells to build more mitochondria, the tiny power plants behind anything lasting longer than a few seconds; yours receive a strong build signal. Studies show that with your version, aerobic training turns into real change inside the muscle more easily.

✧ rs4253778 — PPARA Genotype: GG

WHAT DOES YOUR GENE DO?

This gene decides whether muscles turn first to fat or to carbohydrate during exercise. Fat is the slow, deep fuel store; carbohydrate is the fast one.

WHAT DOES YOUR RESULT MEAN?

You carry GG, meaning the version linked to using fat as fuel more efficiently during long efforts. In practice this shows in how far you can go in a hard session before things start to feel heavy. It is one of the few genetic traits an athlete may actually notice, and it is well supported in endurance research.

✧ rs17602729 — AMPD1 Genotype: CC

WHAT DOES YOUR GENE DO?

This gene makes an enzyme that keeps energy production going inside muscle during intense effort. A faulty copy makes muscles tire and cramp earlier than expected.

WHAT DOES YOUR RESULT MEAN?

You carry CC, meaning the fully working version, on both copies, of an enzyme your muscles rely on in hard efforts. This means you have no inborn ceiling here: when you push, your muscles can keep renewing energy at full speed. Research on this position is clear because the difference between a working and a non-working copy is easy to measure.

✧ rs1805086 — MSTN Genotype: AA

WHAT DOES YOUR GENE DO?

This gene makes myostatin, the brake on muscle growth. It stops muscle building from continuing without limit, which is why strength gains eventually plateau.

WHAT DOES YOUR RESULT MEAN?

You carry AA, meaning the common version on both copies, so your natural limit on muscle growth is set at the usual level. During puberty your muscle can respond to training in the usual way. This gene is famous in animal research; human results like yours are in the everyday range.

✧ rs1042713 — ADRB2 Genotype: AG

WHAT DOES YOUR GENE DO?

This gene makes the receptor adrenaline binds to. It affects heart rate response, how open the airways feel and how hard the body can push in short intense efforts.

WHAT DOES YOUR RESULT MEAN?

You carry AG, meaning one copy of each version at the site where adrenaline binds; this affects heart rate, how open your airways feel and how hard you can push in short intense efforts. Your response to adrenaline is in the usual range, neither unusually strong nor blunted. This is also where asthma inhalers act, which is why this gene appears in studies on breathing during exercise.

08. Oxygen Transport and Vascular Response

How much oxygen reaches working muscle depends on blood vessel growth, blood flow control and the cell's own oxygen-sensing system.

RS	GENE	GENOTYPE	GRADE
rs2070744	**NOS3**	TC	
rs2010963	**VEGFA**	GC	
rs11549465	**HIF1A**	CC	
rs1867785	**EPAS1**	AG	
rs11091046	**AGTR2**	AC	

✧ rs2070744 — NOS3 Genotype: TC

WHAT DOES YOUR GENE DO?

This gene makes the enzyme that produces nitric oxide, the signal that widens blood vessels so more blood reaches working muscle.

WHAT DOES YOUR RESULT MEAN?

You carry TC, meaning one copy of each version; this is linked to a usual ability to widen your blood vessels during exercise and deliver more blood to working muscle. Your oxygen delivery should respond normally when you push. This widening works through nitric oxide, the same pathway targeted by beetroot juice research.

✧ rs2010963 — VEGFA Genotype: GC

WHAT DOES YOUR GENE DO?

This gene directs the growth of new capillaries, the tiny vessels that carry oxygen to individual muscle fibres. More capillaries mean a shorter path for oxygen.

WHAT DOES YOUR RESULT MEAN?

You carry GC, meaning an average result for forming new capillaries, the tiny vessels that carry oxygen to individual muscle fibres. Your capillary network can develop with training at a typical rate. Research on this gene notes that forming new small vessels is one of the slowest changes the body makes, measured in months rather than weeks.

✧ rs11549465 — HIF1A Genotype: CC

WHAT DOES YOUR GENE DO?

This gene is the cell's low-oxygen alarm. When oxygen drops in hard efforts or at high altitude, it triggers the body's oxygen-saving and vessel-building response.

WHAT DOES YOUR RESULT MEAN?

You carry CC, meaning the common version on both copies; this is linked to a normal response to hard aerobic work and high altitude. This gene is your cells' low-oxygen alarm, switching on when oxygen drops in hard efforts or at altitude, and yours works in the usual way. This makes your result the expected one, not a special case.

✧ **rs1867785 — EPAS1** Genotype: **AG**

WHAT DOES YOUR GENE DO?
This gene works with the oxygen alarm above and helps control red blood cell production in response to low oxygen.

WHAT DOES YOUR RESULT MEAN?
You carry AG, the common version, meaning you do not have the high-altitude-adapted form of this gene. Your body meets thin air like most people. The other form is found in Tibetan populations and lets them live at altitude without their blood thickening; this is one of the best-documented examples of recent human adaptation.

✧ **rs11091046 — AGTR2** Genotype: **AC**

WHAT DOES YOUR GENE DO?
This gene is part of the system that regulates blood pressure and vascular tone, and has been studied for its link to muscle fibre composition.

WHAT DOES YOUR RESULT MEAN?
You carry AC, meaning one copy of each version in the system that sets blood pressure and how tight or relaxed your vessels are; this places you in the usual range. The evidence behind this position is weaker than for others in this section, so it is included as background, not as a firm finding.

09. Recovery, Inflammation and Sleep

In youth sport, recovery depends largely on three things: how strong an inflammatory response the body mounts after hard work, how well it clears oxidative stress, and how good its sleep is.

RS	GENE	GENOTYPE	GRADE
rs1800795	**IL6**	GC	
rs1800629	**TNF**	GG	
rs4880	**SOD2**	CT	
rs2794520	**CRP**	CT	
rs228697	**PER3**	CC	
rs1801260	**CLOCK**	TT	

✧ **rs1800795 — IL6** Genotype: **GC**

WHAT DOES YOUR GENE DO?
This gene produces interleukin-6, a signal released by working muscle. Short bursts drive adaptation; persistently high levels cause muscle soreness and fatigue.

WHAT DOES YOUR RESULT MEAN?
You carry GC, one copy of each version; this sets your daily level of interleukin-6, a signal your body releases after hard work. Your muscle-soreness signal sits between the two extremes. Studies measuring muscle-damage markers in blood place a single-copy result like yours in this middle group.

✧ rs1800629 — TNF Genotype: GG

WHAT DOES YOUR GENE DO?

This gene produces tumour necrosis factor alpha, one of the body's strongest inflammatory signals. It shapes how much swelling and pain follow tissue stress.

WHAT DOES YOUR RESULT MEAN?

You carry GG, the low-output version of one of your body's strongest inflammation signals, which helps set how much swelling and soreness follow hard work. For you this means a calmer response after tough sessions. Researchers stress that inflammation is both a damage and a repair signal, so studies define the most useful level as moderate, not the lowest possible.

✧ rs4880 — SOD2 Genotype: CT

WHAT DOES YOUR GENE DO?

This gene produces an antioxidant enzyme that works inside mitochondria, clearing the reactive by-products of energy production. Hard exercise generates plenty of them.

WHAT DOES YOUR RESULT MEAN?

You carry CT, one copy of each version of the enzyme that clears the reactive by-products of energy production in your mitochondria. You have a solid, typical amount of this clearing capacity rather than a large margin. Interestingly, researchers note that these by-products are also part of the signal telling your body to adapt to training, so they are not entirely unwanted.

✧ rs2794520 — CRP Genotype: CT

WHAT DOES YOUR GENE DO?

This variant affects baseline levels of C-reactive protein (CRP), the most commonly measured general inflammation marker in blood tests.

WHAT DOES YOUR RESULT MEAN?

You carry CT, an average starting point for CRP, the general inflammation value included in most blood panels. When you give blood, your baseline is the usual one. This is especially useful as background when a test taken shortly after hard training shows this value slightly raised for entirely normal reasons.

✧ rs228697 — PER3 Genotype: CC

WHAT DOES YOUR GENE DO?

This gene is part of the internal clock that sets when a person naturally feels sleepy and alert, and how hard they find short sleep.

WHAT DOES YOUR RESULT MEAN?

You carry CC; this body-clock gene gives no push toward the late-to-bed type. Your natural sleep timing is typical, not shifted late. This gene appears in a growth report because most growth hormone is released during deep sleep in the first hours of the night.

✧ rs1801260 — CLOCK Genotype: TT

WHAT DOES YOUR GENE DO?

The central gene of the body clock; it affects both preferred sleep timing and how much sleep a person needs to function well.

WHAT DOES YOUR RESULT MEAN?

You carry TT, a typical sleep need, consistent with the body-clock result above. Together they point to typical sleep timing and a typical amount of sleep being enough for you. This central clock gene is mostly studied in terms of preferred bedtime and the amount of sleep needed to feel normal.

10. Injury & Connective Tissue

Connective-tissue markers describe a tendency, not destiny. In youth sport, growth rate, weekly load and technique matter more than genetics; but knowing the tendency shows where to invest time in prevention work.

RS	GENE	GENOTYPE	GRADE
rs12722	**COL5A1**	CT	
rs1800012	**COL1A1**	GG	
rs970547	**COL12A1**	AA	
rs679620	**MMP3**	GA	
rs143384	**GDF5**	AG	
rs1544410	**VDR (BsmI)**	GA	

✧ rs12722 — COL5A1 Genotype: CT

WHAT DOES YOUR GENE DO?

This gene produces type V collagen, which controls how thick and flexible tendon and ligament fibres are. It determines tissue stiffness more than tissue strength.

WHAT DOES YOUR RESULT MEAN?

You carry CT, one copy of the stiffer version, linked to slightly less flexible tendon tissue and slightly greater sensitivity to repeated tendon loading. Simply put, your tendons sit on the tight side of normal rather than the flexible side. This position has repeatedly been linked to Achilles tendon problems and other soft-tissue injuries in athletes.

✧ rs1800012 — COL1A1 Genotype: GG

WHAT DOES YOUR GENE DO?

The same type I collagen gene from the bone section, read here for its effect on ligament strength; this variant changes how much collagen a cell produces.

WHAT DOES YOUR RESULT MEAN?

You carry GG, the common version, so this position adds nothing to your ligament picture. Your ligaments are built from typical collagen. It is a different, rarer version of this position that studies link to ligament tears; you do not carry it.

✧ rs970547 — COL12A1 Genotype: AA

WHAT DOES YOUR GENE DO?

This gene produces a collagen that organises the interface where tendon meets bone and cartilage, the junction where load is transferred and injuries often begin.

WHAT DOES YOUR RESULT MEAN?

You carry AA, the common version, linked to average robustness where your tendons attach to bone. These attachment points are where load is transferred, and yours are built in the usual way. They matter in a youth report because many complaints common in growing athletes, such as Osgood-Schlatter knee pain, arise at exactly these points during rapid growth.

✧ rs679620 — MMP3 Genotype: GA

WHAT DOES YOUR GENE DO?

This gene produces an enzyme that breaks down old connective tissue so new tissue can replace it. Repair depends on breakdown as much as on building.

WHAT DOES YOUR RESULT MEAN?

You carry GA, one copy of each version of the enzyme that clears old connective tissue so new tissue can replace it, so your tissue renewal proceeds at a typical pace. Your tendons renew themselves at a typical rate. Either way, research consistently shows that tendon remodelling is slow in everyone—taking months, not weeks, and lagging far behind the muscles that pull on it.

✧ rs143384 — GDF5 Genotype: AG

WHAT DOES YOUR GENE DO?

The joint-formation gene from Section 2, read here for its role in cartilage maintenance and predisposition to joint and ligament injuries.

WHAT DOES YOUR RESULT MEAN?

You carry AG, one copy of each version, linked to average joint robustness rather than extra built-in protection. Your cartilage maintenance is in the typical range. This is the same joint-shaping gene from your growth section, read here for cartilage, and one of the few genes that appears in both research areas.

✧ rs1544410 — VDR (BsmI) Genotype: GA

WHAT DOES YOUR GENE DO?

The vitamin D receptor from Section 5, read again here because the same switch shapes the quality of both bone and muscle.

WHAT DOES YOUR RESULT MEAN?

You carry GA, the same typical vitamin D result as in your nutrition section; it reappears here because this switch affects muscle as well as bone. So vitamin D matters for your tissue strength as much as for your calcium use. Low vitamin D is one of the most discussed modifiable factors behind bone stress injuries in young athletes, and it is what links these two sections of your report.

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YOUTH & GROWTH

Growth, Development & Sports Predisposition

This report is confidential and intended for the athlete and the coach, trainer, dietitian or healthcare professional they choose to share it with. Genetic results describe tendencies, not certainties, and do not replace clinical assessment.