

G E N E F I T N E S S

Your genetic guide to
PRIME FITNESS



INTRODUCTION

Understanding your report

Have you ever wondered why many Olympics sprint winners are Jamaicans? And why the world's best marathon runners are from Kenya? Do you want to know what sport you are ideally built for? The answer is in your genes.

Some interesting facts about genes and athletic performance:

- Finnish skier Eero Mäntyranta became the "greatest endurance athlete" of his generation in part because of a mutation in his erythropoietin receptor (EPOR) gene which helps produce excessive amounts of red blood cells. His family was found to carry this gene.
- The Kalenjin tribe of Kenya makes up about 12% of the African population. In 2011, 32 Kalenjin runners finished a marathon faster than 2 hours, 10 minutes, whereas only 17 Americans managed to do so historically.
- The Indian Cricket Team, The National Basketball Association (NBA) and other professional sports teams around the world are beginning to incorporate genetics as part of their training regimen.
- A study by Lancashire University showed that when the genotype matched with training, the likelihood of significant improvement was 21 times more for power based activities and 28.5 times more for endurance based activities, when compared with mismatched training.
- Donald Thomas had barely 8 months of training when he won a gold at the Osaka World Championships in '07 beating Stefan Holm, despite Holm's extensive training. Later on, scientists identified one of the key reasons for his dramatic success – a 10.5" uncharacteristically long Achilles tendon. The longer and stiffer the tendon, the more elastic energy it can store, and when stretched, rocket its owner into air.

Recent research has confirmed that our efficiency of performing various physical activities is dependent on a number of genes. Inheritance of favorable genetic type provides an advantage in athletic and sports performance. Genes play a key role in influencing your athletic ability, sports performance and physical fitness.

In this report we profile genes that have been shown to influence endurance performance, aerobic capacity, power/strength activity performance and several other attributes relevant to fitness.

We hope that this report will help you understand your body better and align your training with your genetic type to get the best performance enhancement.

INTRODUCTION

Understanding your report

Human health is a complex interplay between genetics and environment (lifestyle, diet, activity, stress, etc.). Your genes, training and diet, all play a vital role in your overall fitness.

This report is presented in a user friendly language and format. The following tips will help you get the best information value out of the report.

1. The word "likely" is used often in the report. What does it mean?

People generally know that high cholesterol can lead to heart conditions. However, there are individuals with high cholesterol who do not develop heart disease. Similarly, smoking can lead to lung disease, but not always. Hence, certain genetic parameters can lead to certain outcomes but other factors may modify the outcome. "Likely" means, it is more likely that one will see the outcome, but other factors may modify it.

2. What does the term "average" mean in the report?

Average implies neither high nor low, rather an intermediate outcome. For example, average likelihood of injury is an intermediate level between high and low likelihood. Average can also be understood in the context of "Normal" or "Typical" or "Moderate"

3. How do I know which result is applicable to me?

Only results with a check mark  are applicable to you, the others are not applicable. All possible outcomes are provided in the table to provide a context to your outcome.

4. Where did the information contained in the report come from?

The genetic markers that are used in this report are based on scientific studies published in international journals. A list of references is available for you to read on our web blog.

5. Some genes indicate beneficial and some non-beneficial for the same outcome, why?

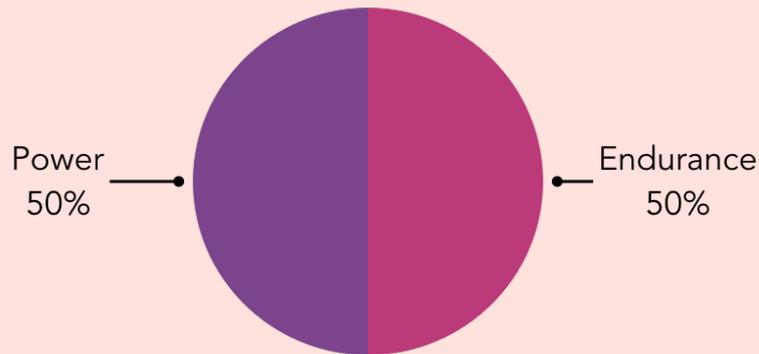
It's estimated that there are around 20,000 to 30,000 genes in the human body. Most of the human body functions are regulated by several genes, not one. Humans have a combination of favorable and unfavorable genes for the same trait. "Your Outcome" indicates an overall outcome from all of the genes. Please note that, not all genes contribute equally towards the trait, hence, pay attention to individual gene outcomes as well and see which one is closely aligned to your own observations about yourself. Olympics athletes, for example, are likely to carry many more gene variants that are favorable, than unfavorable for their sport.

6. Some sentences are colored in green and others in red, why?

Attributes that are advantageous for sports fitness are indicated in green and those that are not advantageous are in red. Neutral outcomes are indicated in black. But do remember, what is an advantage in one thing could be a disadvantage in another and vice versa. For example, generally, being flexible is an advantage, but not so for sprint runners, where inflexibility favours superior performance.

SUMMARY RESULTS

Your Endurance:Power Ratio



Your Exercise Plan

TRAINING TYPE	FREQUENCY	TIME	INTENSITY	TYPE
Cardiovascular exercise	3-4 days/week	20-40 minutes	5 on Borg's scale 70% of HR MAX. Talk test- Can talk with heavy breathing but not out of breath to stop exercising.	Medium Intensity with Cardio Training Method – Ex Brisk Walking, jogging, cycling, trekking, swimming
Strength Training	2-3 days/week	45-60 minutes	70-80% of IRM 8-12 reps x 2-3 sets	Interval Training- alternate explosive strength exercise with less intense strength exercise. Ex – burpees (8x1) and push ups with 30secs rest in between, likewise 10 – 15 exercises.
Flexibility	3-7 days/week	20-30 mins, 2 days a week or 5-10 mins everyday.	Full range of motion to the point of mild tightness.	Dynamic stretches for warm up should be (8x1) static stretches for warm down (hold for 15 secs) Yoga, Taichi etc., or with assistance, carry out stretching, passive stretches or simple single muscle static active stretch

Fitness Results

TRAIT NAME	YOUR RESULTS	POSSIBLE OUTCOMES
Endurance Genetic variations in endurance ability		Average: Likely to be average at endurance activities
		Excellent: Likely to be excellent at endurance activities
	✔	Good: Likely to be good at endurance activities
Aerobic Capacity Genetic variations in aerobic capacity		Average: Likely to have average aerobic capacity
		Excellent: Likely to have excellent aerobic capacity
	✔	Good: Likely to have good aerobic capacity
Heart Capacity Genetic variations in heart capacity		Average: Likely average heart capacity
	✔	Excellent: Likely excellent heart capacity
		Good: Likely good heart capacity
Lung Capacity Genetic variations in lung capacity		Average: Likely average lung capacity
		Excellent: Likely excellent lung capacity
	✔	Good: Likely good lung capacity
Power Genetic variations in power performance		Average: Likely to be average at power based activities
		Excellent: Likely to be excellent at power based activities
	✔	Good: Likely to be good at power based activities
Hand Grip Strength Genetic variations in hand grip strength		Average: Likely average hand grip strength
		Excellent: Likely excellent hand grip strength
	✔	Good: Likely good hand grip strength
Tendon Strength Genetic variations in tendon strength		Average: Likely average tendon strength
		Excellent: Likely excellent tendon strength
	✔	Good: Likely to have good tendon strength
Ligament Strength Genetic variations in ligament strength	✔	Average: Likely average ligament strength
		Excellent: Likely excellent ligament strength
		Good: Likely good ligament strength
Exercise Motivation Genetic variations in exercise motivation	✔	Average: Moderate inclination towards exercise
		Excellent: Highly inclined to exercise with positive mood changes
		Good: Inclined to exercise with positive mood changes

TRAIT NAME	YOUR RESULTS	POSSIBLE OUTCOMES
Likelihood Of Injury Genetic variations in the likelihood of injury	✔	Average: Likely average risk for exercise related injuries
		Lower: Low likelihood of injury
		Higher: Likely more exercise related injuries
Likelihood Of Fatigue Genetic variations in the likelihood of fatigue		Average: Likely to sustain exercise for a moderate duration
		Lower: Likely to sustain exercise for longer durations
	✔	Higher: Likely to sustain exercise for shorter durations
Exercise Recovery Genetic variations in exercise recovery		Average: Likely to have average period of recovery
	✔	Slower: Likely to experience prolonged recovery
		Faster: Likely to experience rapid recovery
HDL Cholesterol Levels With Exercise Genetic variations in HDL levels with exercise	✔	Average: Moderate increase in HDL levels with exercise
		Favorable: Significant increase in HDL levels with exercise
Insulin Sensitivity With Exercise Genetic variations in insulin sensitivity with exercise		Average: Moderately improved insulin sensitivity with exercise
	✔	Favorable: Enhanced insulin sensitivity with exercise
Weight Loss Or Weight Gain With Exercise Genetic variations in weight gain or loss with exercise		Average: Likely to experience moderate weight loss
	✔	Unfavorable: May not experience much weight loss
		Favorable: Likely to experience higher weight loss

1. ENDURANCE

Good: Likely to be good at endurance activities

Endurance is the body's capacity to utilize oxygen for energy production and sustain it for a prolonged duration of physical activity. A high endurance individual can sustain an activity for a prolonged duration, with minimal discomforts like breathlessness and fatigue. We have analyzed genes that influence endurance aspects such as the type of fuel used by the cells for energy production, percentage distribution of muscle fibers (slow twitch and fast twitch) and the adaptability of the blood vessels to carry more oxygen. People of certain genetic types are better at endurance based activities than others.

Recommendation:

- **ACTIVITIES** : Medium intensity workouts like jogging, running, strength training with moderate weights and more repetitions can be performed for longer durations.

- **NUTRIENTS**: Manganese (Mussels (Seafood), Hazelnuts, Pumpkin Seeds, Cloves, Whole Wheat Bread), Magnesium (Pumpkin seeds, Almonds, Mackerel, Spinach, Lima Beans), Zinc (Oyster, Beef/Lamb, Pumpkin seeds/Squash seeds, Cocoa powder, Cashew nuts), Iron (Spirulina, Oysters, Beef/Liver, Apricot, Spinach) and Potassium (dried apricots, salmon, potato/sweet potato, avocado, spinach).

Genes analyzed: *CAMK1D, ACOXL, ACE, CLSTN2, ACTN3, ADRB3, PPC3B, TSHR, TPK1, SPOCK1, SOD2, SGMS1, RFX1, PPARGC1A, CPQ, NFIA-AS2, CKMM, PPARGC1B1, UCP2, PPARD, UCP3, VEGFR2, NFATC4, PPARGC1A1, GABPB1, GABPB11, HFE, ADRB2, PPARGC1B, VEGFA, PPARA, ADRB1, NRF2, SLC2A4, HIF2A1, ZNF429, PPARD1, ITPR11, KCNJ11, GALM, L3MBTL4, NALCN-AS1, GNB3, FMNL2, NATD1, IL15RA, CRP, GRM3, ITPR1, HIF1A, ADRB21, HIF2A, AGTR2*

2. AEROBIC CAPACITY

Good: Likely to have good aerobic capacity

Aerobic capacity (VO₂ max) is the maximum capacity of our body to transport and utilize oxygen during exercise and is partially genetically influenced. During exercise, muscles work harder than at rest and, therefore, need more energy. The ATP energy required by the muscles is produced with the help of oxygen. This is the reason why there is progressive increase in breathing when the intensity of exercises increases. The body needs more oxygen to produce the necessary ATP energy for muscle movement. People of certain genetic types differ in the level of oxygen uptake during exercise.

Recommendation:

- **ACTIVITIES** : Aerobic exercises including skipping, running, cycling, skating, swimming, high intensity interval training, cross fit training.

- **NUTRIENTS** : Iron (spirulina, oysters, beef/liver, apricot, spinach), Magnesium (pumpkin seeds, almonds, mackerel, spinach, lima beans) and Ubiquinol (Coenzyme Q10-peanuts, chicken, spinach, avocado, broccoli))

Genes analyzed: *ADRB2, PPARGC1A, GABPB1, PPARA, VEGFA*

3. HEART CAPACITY

Excellent: Likely excellent heart capacity

Heart Capacity is the ability of the heart to increase cardiac output to meet increased needs for oxygen during physical activity or exercise. Cardiac capacity is a combination of the physical condition of the heart and aerobic fitness level. People of certain genetic types have better heart capacity than others.

Recommendation:

- Comment: Expected to have better heart capacity

Genes analyzed: *NOS3, CREB1, KIF5B, NPY*

4. LUNG CAPACITY

Good: Likely good lung capacity

Total lung capacity, or TLC, refers to the total amount of air in the lungs after taking the deepest breath possible. People of certain genetic types have higher lung capacity than others.

Recommendation:

- **ACTIVITIES** : Expected to have good lung capacity and moderate likelihood of feeling 'short of breath'. Aerobic training can increase lung capacity over time

Genes analyzed: *NRF1, ADRB1, NRF11, APOE1*

5. POWER

Good: Likely to be good at power based activities

Power is the rapid burst of energy observed during high intensity activities of shorter duration. Type II or fast twitch muscle fibers allow us to perform rapid, high intensity movements. The ability of blood vessels to constrict and make oxygen utilization more efficient is also important for power. We have analyzed genes that influence the percentage distribution of muscle fibers (slow twitch and fast twitch) and their ability to exert maximal power over a short period of time. People of certain genetic types are better at power based activities than others.

Recommendation:

- **ACTIVITIES** : High intensity exercises including sprinting, cycling, high intensity interval training, cross fit training, strength training with heavy weights and fewer repetitions can be performed.

- **NUTRIENTS**: Caffeine (maximum 400mg/day). Slow metabolizers of caffeine should not consume above 100mg/day

Genes analyzed: *SUCLA2, PPARG, ZNF423, NOS3, PPARA, IL6, HSD17B14, AGT, ADRB21, AGTR2, ADRB2, TRHR, CKM, EPAS11, DMD, MPRIP, MED4, AMPD1, GALNT13, UCP2, CREM, TPK1, IGF1, COTL1, CALCR, CACNG11, SLC16A1, ARHGEF28, EPAS1, HIF1A, MTHFR, ACTN3, VDR1, RC3H1, PPARGC1B, FOCAD, VDR2, MTRR, MTR, NRG1, WAPAL, CRP, VDR, GPC5, GABRR1, IP6K3, CLSTN2*

6. HAND GRIP STRENGTH

Good: Likely good hand grip strength

Muscle strength, measured by hand grip strength, is an accessible and widely used proxy of muscular fitness. Hand grip strength is associated with frailty and risk of fracture. People of certain genetic types have a better hand grip strength than others.

Recommendation:

- **ACTIVITIES** : Expected to have good hand grip strength. Resistance training can increase muscle strength over time.

Genes analyzed: *SYT1, PEX14, ERP27, GBF1, KANSL1, MGMT, GLIS1, HOXB3, TGFA, UCP3, SLC8A1, LRPPRC*

7. TENDON STRENGTH

Good: Likely to have good tendon strength

Tendons and ligaments are dense connective tissues made of collagen or elastin fibers that run parallel to each other, creating strong cords. A tendon is a band of fibrous connective tissue which connect muscle to tenocytes, increasing their tensile strength. People of certain genetic types have a better tendon strength than others.

Recommendation:

- Likely good tendon strength. Resistance training can increase tendon strength over time.

Genes analyzed: *MMP31, MMP3, GDF5, MMP32*

8. LIGAMENT STRENGTH

Average: Likely average ligament strength

Tendons and ligaments are dense connective tissues made of collagen or elastin fibers that run parallel to each other, creating strong cords. Ligaments connect bone to bone to form joints -- such as knees, elbows, hips and ankles. People of certain genetic types may have stronger ligaments than others.

Recommendation:

- **ACTIVITIES** : Resistance training helps in increasing ligament strength. Warming up before resistance training is recommended

Genes analyzed: *CILP, COL5A1*

9. EXERCISE MOTIVATION

Average: Moderate inclination towards exercise

Certain individuals readily take up physical activity, while others lack the motivation for it. Neurochemicals produced by the body in response to exercise influence how much we get habituated to physical activity and hence are motivated to repeat it again and again. People of certain genetic types take to physical activity more readily than others.

Recommendation:

- **ACTIVITIES** : May find it hard to develop the habit of regular exercise. Group exercises, gym buddies, dancing, sports and other fun physical activities are some ways to overcome this.

Genes analyzed: *BDNF*

10. LIKELIHOOD OF INJURY

Average: Likely average risk for exercise related injuries

Sportsmen and runners who place stress on the Achilles tendon have the greatest likelihood of muscle injury and tendinopathy. The Achilles tendon connects your calf muscles to your heel bone. Tendinopathy refers to injury to the tendon. People of certain genotypes are more prone to injury than others and are at increased risk of tendinopathy and other related injuries.

Recommendation:

- **ACTIVITIES** : Average likelihood of injury.

- **NUTRIENTS**: Alpha linolenic acid, Eicosapentaenoic acid (flaxseed oil, fish oil (salmon), chia seeds, walnuts and walnut oil, caviar), Docosahexaenoic acid (salmon, sardines, mackerel, beef, flaxseed)

Genes analyzed: *MMP3, MCT1*

11. LIKELIHOOD OF FATIGUE

Higher: Likely to sustain exercise for shorter durations

Do you normally feel excessively tired after exercise? If yes, the answer to this may be in the expression of certain genes in your body. Lactate is the preferred source of fuel for energy production in the exercising muscle when there is a lack of oxygen (anaerobic metabolism). When muscles use up energy during physical activity, there is lactate build-up, which can lead to muscle fatigue. Apart from this, exercise-induced rise in inflammation and sub-optimal flexibility could also be contributing factors for muscle fatigue. People of certain genetic types have better flexibility than others.

Recommendation:

- **ACTIVITIES** : You are likely to sustain physical activity of your choice for shorter durations. Take sufficient breaks between sets before continuing.

- **NUTRIENTS**: Hydroxy methyl butyrate (grapefruit, alpha alpha, cat fish, avocado), Manganese (mussels (seafood), hazelnuts, pumpkin seeds, cloves, whole wheat bread) and Ascorbic acid (Vitamin C- guava, kiwi, black currant, red bell pepper, orange)

Genes analyzed: *MCT1, TNF*

12. EXERCISE RECOVERY

Slower: Likely to experience prolonged recovery

The process of exercise causes inflammation and minor tissue damage. During rest periods, the body heals and recovers from this damage. People of certain genetic types recover quickly, while others require longer periods, which influences the frequency of exercise, rehab intensity and supplementation needs.

Recommendation:

- **ACTIVITIES** : Longer resting periods between sessions may be required.

- **NUTRIENTS**: Curcumin (turmeric), Polyunsaturated fatty acids (soybean oil, corn oil, walnuts, salmon, pine nuts), Glucosamine (shrimp with shell, lobster with shell, crab with shell, crawfish, bone broth)

Genes analyzed: *SOD2, TNF*

13. HDL CHOLESTEROL LEVELS WITH EXERCISE

Average: Moderate increase in HDL levels with exercise

Regular exercise helps in increasing your HDL cholesterol levels. People of certain genetic types experience a greater increase in HDL levels than others.

Recommendation:

- **ACTIVITIES** : Regular exercise may moderately improve your HDL levels.
- **NUTRIENTS**: Folate (beans, lentils, spinach, lettuce, broccoli), Omega 3-fatty acids (flaxseed oil (cold pressed), salmon fish oil, chia seeds, walnuts, mackerel), Niacin (tuna, chicken breast, peanuts, sunflower seeds, mushrooms), Fibre rich diet (one bran cereal, amaranth grain, white beans cooked, sesame seeds, fig dried)

Genes analyzed: *PPARD*

14. INSULIN SENSITIVITY WITH EXERCISE

Favorable: Enhanced insulin sensitivity with exercise

Exercise generally improves your insulin sensitivity. People of certain genetic types experience greater improvements than others.

Recommendation:

- **ACTIVITIES** : Regular exercise may significantly improve your insulin sensitivity.
- **NUTRIENTS**: Lipoic acid (chia seeds, flaxseeds, red meat, beets, spinach), Magnesium (pumpkin seeds, almonds, mackerel, spinach, lima beans), Polyunsaturated fatty acids (soybean oil, corn oil, walnuts, salmon, pine nuts), Resveratrol (red grapes, boiled peanuts, dark chocolate/ cocoa powder, berries, pistachios) and Vitamin D (crimini mushrooms, salmon, fortified breakfast cereal, fortified tofu, eggs)

Genes analyzed: *LIPC*

15. WEIGHT LOSS OR WEIGHT GAIN WITH EXERCISE

Unfavorable: May not experience much weight loss

Regular exercise aids in weight management via improved metabolism. People of certain genetic types may benefit more than others in terms of weight loss in response to exercise.

Recommendation:

- **ACTIVITIES** : Likely to lose less weight upon taking up regular exercise. Continue to exercise, additionally, focus on dietary means to further reduce weight.
- **NUTRIENTS**: Chitosan (outer shells of crab, outer shells of crayfish, outer shells of shrimp, outer shells of squid), Synephrine (Bitter Orange), Conjugated linolenic acids (Grass Fed Cow's Whole Milk, Grass Fed Cow's Cheese, Grass Fed Beef, Cheddar Cheese, Safflower Oil), Pyruvate (red apple, cheese, dark beer, red wine), Fucoxanthin (brown seaweed), Hydroxycitric acid (garcinia cambogia, lemon, grape fruit, orange), Glucomannan (konjac root, shirataki noodles, pasta)

Genes analyzed: *ADRB2, FTO, INSIG2*

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