Summarised GENESPORT™ Report

Name	Female	Report Date	2022-03-22
Surname	Case Study	Date of Sample Collection	2016-05-15
Ref Number	00001014	Date Sample Received	2016-05-17
Sample Type	Buccal Swab	Referring Practitioner	Female Case Study
Gender	Female	Estimated Weight	64
Age	49	Estimated Height	1.6
Race	White/Caucasian	Estimated Waist	80
Date of Birth	1971-10-10	Blood Pressure	Normal

GENESPORT™

UNDERSTANDING THE RESULTS

The complexity of modern health care necessitates an innovative approach to manage the risk of multifactorial diseases that could be applied in a medical context where genetic test results are integrated with relevant clinical, environmental, lifestyle and pathology assessments.

Variations in DNA

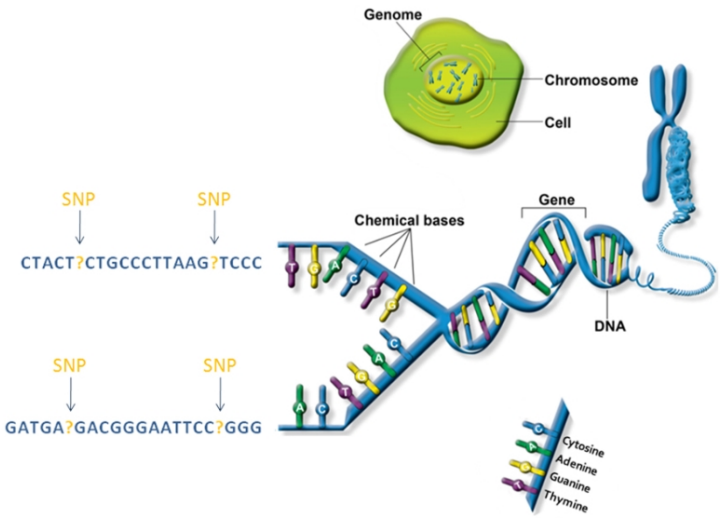
Genetic variations account for the different phenotypes and diverse responses to the environment between individuals. The detection of genetic variations are reported as Single Nucleotide Polymorphisms (SNPs) or copy-number variations (CNVs).

CNVs

CNVs comprise deletions, insertions and duplications. A CNV is present when the number of copies of a particular gene varies from one individual to the next. Thus, the genome (the entire set of 23 chromosomes in a person) experiences gains and losses of genetic material. http://www.emedmd.com

SNPs

DNA molecules consists of four different types of nucleotides that pair with each other in a very specific manner. Complementary base pairings are responsible for the double-helix structure of DNA. There are four different kinds of nucleotides that make up DNA: adenine (A), cytosine (C), guanine (G) and thymine (T). Only two kinds of base pairs are possible: GC (or CG) and AT (or TA). A variation at a single base pair is called a SNP. SNPs generate biological variation between people.
https://kaiserscience.wordpress.com/biology-the-living-environment/genetics/



Result Legend

- The red circle indicates a high impact, compared to the impact of the general population.
- The yellow circle indicates a moderate impact, compared to the impact of the general population.
- The green circle indicates a low impact, compared to the impact of the general population.
- The blue circle indicates no impact, (neutral effect) compared to the impact of the general population.

Overview of Current Profile

Personal History

Cognitive
Diabetes
Fatty Liver
Thyroid
Overweight
PCOS
Pregnancy Loss
Sleep
Allergy: Fish

Injury/Surgical History

Joint Pain

Diet

Fat Intake - High
Folate Intake - Moderate
Fibre & Magnesium Intake - Moderate

Physical Activity

Casual, 1 - 2 days a week, 45 min, Very low intensity
Activity: Household cleaning activities

Lifestyle

Body Mass Index
Exercise: 1 - 2 days a week
Eating habit: Fair
Non-Smoker
Alcohol Consumption - Low

Pharmaceutical

Vitamin B-complex
Protein or other Shake
HMB (Beta-Hydroxy-Beta-Methylbutyrate)
Vitamins

Gene Impact Summary

Unfavourable				Favourable
	Fuel Mobilisation during Endurance Activities	Recovery: Inflammation & Immunity	Endurance - Lower Intensity Exercise (Aerobic Predisposition)	Iron Balance & Metabolism
	Fuel Switching during Exercise	Musculoskeletal Injury Susceptibility	Lactate Threshold	Energy Production during Exercise
	Collagen Requirement	Recovery: Oxidative Stress & Detoxification		
	Sodium Sensitivity	Antioxidants for Sports Performance & Recovery		
		Training Times		
		Altitude Training		
		Power / Strength - Higher Intensity Exercise (Anaerobic Predisposition)		
		VO2Max Trainability (Oxygen Uptake)		
		Exercise Tolerance		
		Blood Flow		
		Vitamin D Requirement		
		Caffeine Sensitivity		
		Omega-3 Fatty Acids Requirement		
		Glutathione Metabolism		

Recommendations & Comments

Biomarkers & Clinical

Bone Mineral Density Scan

Electrolyte Panel (Kidney Function)

High sensitivity C-Reactive Protein (hs -CRP) (Ideal: <1 - 1.5mg/L)

Hydroxy-2-deoxyguanosine (8-OHdG) to measure oxidative stress

Iron Profile (including Ferritin)

Ultrasound of Achilles Tendon

Vitamin D3 (Ideal 50 - 85ng/ml)

Diet

Anti-inflammatory diet eg Okinawan & Mediterranean diets high in Omega -3

Avoid saturated fatty acids

Beetroot juice (500ml) to enhance Nitric Oxide production

Caffeine dosage: 3-6mg/kg body weight (100mg caffeine in 1 cup filter coffee)

Consumption of a mixed protein and low glycemic index carbohydrate meal after exercise assists recovery

Increase nitric oxide foods: beets, rocket, pomegranates, celery & watermelon

Increased need for collagen (eg bone broth)

Monitor and manage sodium intake (1500-2000mg/day) and follow a diet rich in potassium

Recovery nutrients: Vit C & A, Omega -3, zinc, collagen & antioxidants

Supplements / Nutrients

Antioxidant supplementation eg GENEWAY™ Antioxidant: 2-4 caps/d

Collagen 7.5-15g/day e.g. GENEWAY™ Collagen 1-2 scoops/day

Creatine Monohydrate (see detailed report for doses)

Creatine: 3-10g/day

Curcumin: 500-1500mg/day

Fiber: 4-6g/day, mostly soluble

L-Carnitine: 1-2g/day

Magnesium 500-1500mg/d e.g. GENEWAY™ Magnesium: 1-4 capsules/day

NEM - Natural Eggshell Membrane eg Flexofend (osteoarthritis)

Omega-3 (DHA/EHA)

Supreme Wellness Multivitamin: 2-4 tablets/d

Vitamin Bs (as recommended by healthcare practitioner)

Vitamin C: 100-500mg/day

Zinc (during acute inflammation episodes: 50-75 mg/day)

Physical Activity

Train-high, compete-low will be advantageous

Very good exercise-induced mitochondrial biogenesis

Lifestyle

Aim for 'green exercise': exercising in natural versus built environments due to your impaired GST detoxification

Consuming carbohydrate-based beverages during prolonged exhaustive exercise may help to reduce inflammation

Ensure sufficient amount of sleep daily (7-9 hours) for better handling oxidative stress

Pharmaceutical

Access the World Anti-Doping document that identifies the substances and methods that are prohibited to athletes here: https://www.wada-ama.org/

Consider IV (intravenous) / liposomal glutathione due to absent GST gene

Other

Consider Low-Level Light Therapy (LLLT)

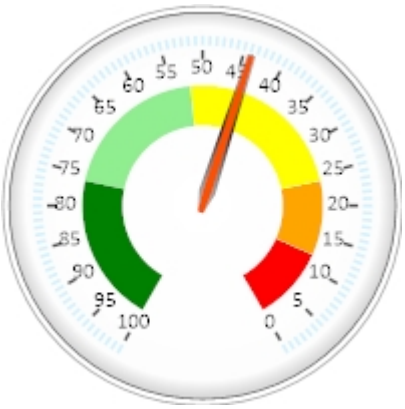
Elevated risk for high-altitude pulmonary edema

High risk for developing osteoarthritis

Less likely to continue an exercise program, fitness motivation might be required

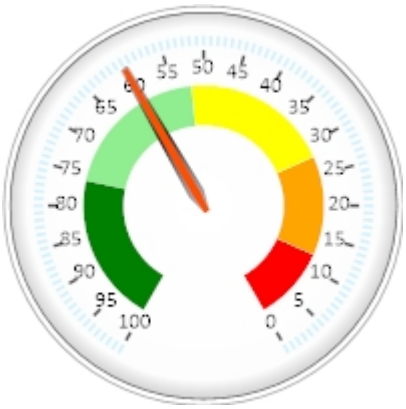
What do the results mean?

Power / Strength - Higher Intensity Exercise (Anaerobic Predisposition)



Good power and strength predisposition. Exercise for endurance takes place in heart rate zones 4 and 5. Your gene composition approximates that of the general population when it comes to power and strength-related activities. Strength is the ability to exert a certain level of power or maximal output over a short period of time, typically 10-30 seconds e.g. sprint training. This result should not change your sporting or fitness goal but rather help you understand how best for you to reach that goal, by taking advantage of your genetic strengths.

Endurance - Lower Intensity Exercise (Aerobic Predisposition)



Remarkable endurance predisposition. Exercise for endurance takes place in heart rate zones 1, 2 and 3. Your gene composition is comparable to those of elite endurance athletes. You have an advanced genetic ability to excel in endurance-related sports. Endurance-related activities are typically moderate-intensity exercises with extended duration times such as cycling and running. In the gym, this might be 3 sets of 10 repetitions. However, to maximize overall fitness and health, you need to add anaerobic (power and strength) types of training also to your exercise routine. Statistically, the odds of having the perfect genetic score is 0.0005%.

VO2Max Trainability (Oxygen Uptake)

You have genetically a typical or intermediate VO2max trainability. Aerobic potential or VO2max is the highest rate of oxygen consumption attainable during exhaustive exercise and is considered one of the best measurable indicators of a person's aerobic potential and capacity for endurance activities. VO2max is the threshold of the body's ability to transport and use oxygen during physical activity. VO2max based training is typically intense interval training. You will still be able to improve VO2max. Focus on lactate threshold training and movement efficiency to improve aerobic endurance performance. Other terms that have been used to describe VO2max include aerobic power, aerobic capacity, and maximal oxygen uptake. In order to determine your own VO2max, you can take measurements at your biokineticist or health club if the equipment is available.

Musculoskeletal Injury Susceptibility

Average risk for musculoskeletal injury. According to your gene profile, your susceptibility for soft tissue injuries (e.g. tendons) is typical of the population average. Injuries in sport commonly occur to the musculoskeletal system and can be simple, involving the muscle, ligament, tendon or bone, or complex, involving more than one aspect of the musculoskeletal system.

Recovery: Oxidative Stress & Detoxification

Oxidative stress is a natural occurrence that increases during exercise. The ability of the body to control oxidative stress and detoxify is largely influenced by genetics. Your post-exercise recovery rate is slower due to genetic variations detected. You can compensate for these genetic limitations with antioxidant supplementation, a proper diet and sufficient rest between intense exercise activities. Inflammation is the other factor that affects recommendations around recovery time.

Recovery: Inflammation & Immunity

Typical anti-inflammatory response. Inflammation is a normal immune response and an essential part of tissue healing following exercise. The essential anti-inflammatory response is controlled by various genes. The results from your gene test, are associated with a possible above-average increase in inflammatory markers following hard exercise. In order to avoid tissue damage, aim for a recovery time period between highly intense sessions of approximately one day. Anti-inflammatory nutritional support may be required.

Energy Production during Exercise

Your genetic profile shows a highly efficient energy production during exercise. The mitochondria are the key sites of energy production (in the form of ATP - adenosine triphosphate) for muscle fibers. Mitochondria use carbohydrates (sugar) molecules to produce ATP in the presence of oxygen. ATP provides the muscles with energy during exercise.

Fuel Mobilisation during Endurance Activities

Your genetic ability to mobilise internal substrates (glycogen and fat stores) during longer duration physical activities, is below average. That may affect glucose control and fat breakdown during exercise. Changes in substrate utilization are highly influenced by exercise duration and intensity. The longer the time spent exercising, the higher the contribution of fat as an energy substrate. With increasing intensity, the contribution of carbohydrates to energy expenditure increases and the contribution of fatty acids decreases.

Fuel Switching during Exercise

Carbohydrate depletion in endurance sports leads to the ''hitting the wall'' phenomenon. Shifting of fuel sources during exercise from predominantly glycogen to fat stores, will preserve glycogen stores and thus increase performance during endurance events. According to your results, a decreased genetic ability to facilitate fuel switching from glycogen to fat (glycogen sparing) during endurance events is detected. You are likely to benefit from regular carbohydrate repletion during events. Caffeine consumption is less likely to stimulate fuel switching from glycogen to fat stores.

Lactate Threshold

Above average lactate threshold trainability (LTT). The lactate threshold (LT) reflects the physiological response to a given workload. The more work you can do before reaching your LT, the better. Lactate shuttling is the balance between fast-twitch muscle fibers producing lactate and slow-twitch muscle fibers using lactate as a fuel during exercise. Good clearance of lactate levels, such as with your result, can improve performance and the intensity of exercise can be higher. In addition, if you take 5-6 few weeks off, you are likely to get back to your peak LT levels sooner than most people. During exercise, lactate has 3 primary roles: i. Major energy source ii. Supports optimal blood sugar levels. iii. Inhibits the breakdown of fat for energy.

Altitude Training

Average response to hypoxic training. Your overall genetic profile is associated with a slower response to hypoxic training and a suboptimal adaptation to altitude. You can still benefit from altitude training but experiment at non-critical periods of the competitive season to determine how you respond. Altitude training is a popular protocol among athletes to increase exercise capacity or to acclimatize prior to competitions. To optimise the potential benefits from altitude training: i. Maintain sufficient levels of iron in the diet. ii. Hydrate well – the body tends to lose water and sodium during acclimatisation and this may lead to dehydration. iii. Spend a minimum of 2-3 weeks doing altitude training. iv. Moderate your physical activity for the first few days during altitude training.

Exercise Tolerance

Typical ('normal') exercise tolerance. Rate of perceived exertion (RPE) or exercise tolerance refers to the capacity of an individual as measured by their ability to endure exercise and/or the maximum workload achieved during the exercise period. Both physiological and affective factors (e.g. mood response) are influenced. The rate of perceived exertion has approximately a 35% heritable component. It affects motivation to exercise, exercise behaviour and sporting performance. Based on your overall genetic profile, you have an average perceived exercise tolerance (e.g. feeling fatigued) and pain threshold. This is considered the most common outcome. Exercise tolerance can be increased via various fitness, lifestyle and nutritional strategies.

Training Times

The genetic result categorises you as an 'Intermediate Circadian Chronotype'. According to research, the best time to train and your best sporting performance might be from about 6 hours after waking up into the mid-afternoon. However, several other factors affect sporting performance to a greater extent than the chronotype such as the diet, motivation, skill and other genetic predispositions.

Blood Flow

Blood flow and the fluid (water)/sodium balance in the blood is regulated by the blood pressure. Blood flow is key to bringing the oxygen necessary for aerobic energy (ATP) production as well as removing by-products in working muscles. Based on your genetic results, you are at above-average risk for a raised blood pressure during intense exercise, especially in the presence of habitually high salt intake. An increase in blood pressure decreases blood flow to working muscles and induces fatigue. Careful balancing (intake versus loss) of sodium is necessary. Blood flow also affects oxidative stress, detoxification, inflammation, VO2max and the usage and replenishing of glycogen stores.

Overall Nutritional Requirements

Antioxidants for Sports Performance & Recovery

Based on your genetic results, you have an impaired endogenous antioxidant ability to defend against free radical damage. Your antioxidant requirements are above the recommendations for the general population. Professional sportspeople or highly active individuals may require even more. You would benefit from an increased intake of antioxidant-rich foods or supplementation.

Collagen Requirement

Due to genetic collagen production impairment, your recommended intake of hydrolyzed collagen is 7.5-15g per day (1-2 scoops of GENEWAY Peptan Collagen).

Omega-3 Fatty Acids Requirement

Your genetic results indicate that you would benefit from an intake between 1,5 to 2 grams of Omega-3 daily unless indicated otherwise by your Healthcare Practitioner.

Iron Balance & Metabolism

The genetic analysis did not detect any variations in your iron metabolism profile. Notwithstanding this favourable result, intense training does speed up iron loss. A full iron blood profile should be monitored in athletes and vegetarians.

Vitamin D Requirement

Based on the genetic profile, you are at risk to have sub-optimal vitamin D concentrations. Supplementation may be required. However, test your body's vit D stores before supplementing, since it accumulates in body fat and mega-doses can cause vit D toxicity. A daily vit D3 intake of 4000 IU (100 mcg) should be enough to ensure optimal levels if you are very active, but you may require more if your vit D deficient.

Sodium Sensitivity

According to your genetic profile, you are at an increased risk to develop salt-sensitive hypertension or high blood pressure when salt (specifically sodium) consumption is excessive. Do not exceed a daily intake of 1500 mg sodium. This equals about 2/3 of a teaspoon (3 grams) of salt per day, however, if you perspire heavily, you may need to increase the sodium intake. (ACE, AGT genes)

Glutathione Metabolism

Based on your genetic profile, you have an impaired ability to produce glutathione, the 'master' antioxidant that binds free radicals. During exercise, the body's increased oxygen demands produce more free radicals. Free radicals can be harmful to your tissues affecting athletic performance and recovery. Most athletes benefit from taking glutathione irrespective of genetics, for example, a 90-minute exercise routine can cause as much as a 60% depletion of glutathione in the bloodstream.

Caffeine Sensitivity

Your genetic profile indicates you are a slower metabolizer of caffeine and may be at risk of potential side-effects when consumed. You can benefit from caffeine's ergogenic effects by consuming approximately 3-4mg/kg body mass, 30 to 60 minutes before a sporting event. The effects of caffeine include reduced feelings of physical fatigue, increased thought-processing and improved focus and concentration. CYP1A2

YOUR RECOMMENDED EXERCISE PROGRAM

Your entire panel of gene results is used to generate the physical fitness recommendations. Although critical to include, genes alone do not provide enough information to determine the best exercise program for you. Some other factors to take into consideration include your goals, current fitness level, your medical history, whether it will be group or individual training sessions, what type of terrain, personal safety, and nutritional requirements to name a few.

Consult a qualified Health Care Professional e.g. a biokineticist, professional coach or medical doctor before initiating or altering a fitness routine. Start your new fitness program gradually and add exercise intensity and duration steadily.

The FITTE Principle for fitness planning

1. Frequency: the number of activity sessions per week
2. Intensity: how high of a demand the activity will be
3. Time: duration of the session
4. Type: mode of activity (running, cycling, walking, dancing, lifting weights, yoga, etc.)
5. Enjoyment!

CARDIO TRAINING ZONES

With the assistance of a Heart Rate (HR) Monitor or by means of your Rate of Perceived Exertion (RPE), you will be able to monitor your training within a set intensity range or "zone" that will correspond to your fitness goals.

You can determine your intensity range by one of the following methods:

1. Rate of Perceived Exertion (RPE)
2. Target Heart Rate (THR)
3. Lactate Threshold Heart Rate (LTHR)

Rate of Perceived Exertion (RPE)

The Rate of Perceived Exertion (RPE) scale of 0-10 is an easy alternative to a monitoring device and is determined by your perception of a training session with a score of zero (0) being no exertion, and 10 being maximum output.

Target Heart Rate (THR)

Your Target Heart Rate (THR) is a percentage of your Maximum Heart Rate (HR_{max}). A straightforward (but less scientific) way to find your HR_{max} is to subtract your age from 220. Once you have your HR_{max}, you can calculate your THR for moderate and vigorous aerobic activity. Moderate aerobic activity is 60% to 70% of your HR_{max}. Vigorous aerobic activity is 70% to 80% of your HR_{max}.

How to calculate your Target Heart Rate

Example of Target Heart Rate for a 45-year old:

Maximum Heart Rate: 220 – 45 years = 175 beats per minute (bpm)

60% of 175 bpm = 105 bpm and indicates moderate intensity.

80% of 175 bpm = 140 bpm and indicates vigorous intensity.

RATE OF PERCEIVED EXERTION AND TARGET HEART RATE ZONES

Target Zone	Description	Intensity % of HRmax (bpm)	Example Durations	RPE	Training Benefit, Effort and Recommendations
1	Active Recovery Zone	50-60% 104-114 bpm	20-40 minutes	<2	Benefits: Helps prevent injury and aids in recovery. Effort: Very light intensity, easy with little strain. Recommended: Essential for warming up and throughout the training session, for recovery and the cooling down phase.
2	Endurance Zone	60-70% 114-133 bpm	40-80 minutes	2-3	Benefits: Improves general fitness, boosts metabolism and aids in recovery. Effort: Easy to breathe and having a conversation. Light intensity, easy and comfortable, low muscle and cardiovascular load. Recommended: During base training periods (lengthy training session) and for recovery during race periods.
3	Aerobic Zone	70-80% 133-152 bpm	10-40 minutes	4-5	Benefits: Improves training times, efficiency and moderate intensity efforts start feeling easier. Effort: Steady, controlled, fast breathing. Recommended: For performance gains and during training sessions for upcoming race days.
4	Threshold Zone	80-90% 152-172 bpm	2-10 minutes	5-6	Benefits: Improves high speed endurance sustainability. Effort: Muscular fatigue and heavy breathing is experienced. Recommended: For professional athletes who are training all year round. Important to incorporate during pre-competition training.
5	Anaerobic Zone	90-100% 171-190 bpm	less than 5 minutes	>6	Benefits: Develops maximum performance and speed. Effort: Near maximal to maximal effort for breathing and muscle exertion. Recommended: For final training preparation, using short repeat intervals of less than 5 minutes.

bpm – beats per minute

HR_{max} – Maximum Heart Rate

RPE - Rate of Perceived Exertion

Lactate Threshold Heart Rate

One of the best ways to determine your individual target intensity zones for training, is by using a Heart Rate Monitor to establish your Lactate Threshold Heart Rate (LTHR). The lactate threshold is the exercise intensity at which lactate (lactic acid) starts to accumulate in the bloodstream. When you cross this threshold your endurance performance is diminished, and your pace is likely to slow. Therefore, training in the correct zone becomes of utmost importance. As you get fitter, your LTHR will increase. Re-testing every six weeks is suggested to both determine your improvement and refine your training zones.
Using the 30-minute test you can determine your LTHR, also often referred to as anaerobic threshold or functional threshold heart rate.

Step 1:
To prevent injury, do a light intensity warm-up, for example jog for several minutes.

Step 2:
Run or ride a bike as fast as you can for 30 minutes on a flat surface (this can also be done on a treadmill or bicycle trainer). Use your average heart rate for the last 20 minutes to estimate your LTHR. This value would be used to set up your training zones. Record your heart rate at 10 and 30 minutes. Add the results and divide them by two. The 30 minutes do not include the time spent during the warm-up session in step one. The LTHR is typically ±85% of your Maximum Heart Rate (HRmax).

Step 3:
Multiply your LTHR by the percentages given in the table below to calculate your target heart rate for each zone.

EXAMPLE TO CALCULATE YOUR LACTATE THRESHOLD HEART RATE (LTHR) AND TARGET HEART RATE PER TRAINING ZONE

The 30-minute test for Lactate Threshold Heart Rate (LTHR)	
Heart Rate at 10 minutes into the test (bpm):	e.g. 172
Heart Rate at 30 minutes into the test (bpm):	e.g. 178
LTHR (average heart rate during the last 20 minutes):	175

Multiply LTRH (e.g. 175 bpm) with % in Level			RPE	TARGET HR
Level 2	Endurance	81-89%	2-3	142 bpm
Level 4	Sub-Lactate Threshold	94-99%	4-5	165 bpm
	Lactate Threshold	100%	5	175 bpm
Level 6	Aerobic capacity (VO2max)	103-106%	6-7	180 bpm

Lactate Threshold Heart Rate Zones

ZONE	INTENSITY	% OF LACTATE THRESHOLD HEART RATE	RPE
LEVEL 1	Recovery	<81%	<2
LEVEL 2	Endurance (Aerobic)	81-89%	2-3
LEVEL 3	Tempo	90-93%	3-4
LEVEL 4	Sub-Lactate Threshold	94-99%	4-5
	Lactate Threshold	100%	5
LEVEL 5	Supra-Lactate Threshold	101-102%	5-6
LEVEL 6	Aerobic capacity (VO2max)	103-106%	6-7
LEVEL 7	Anaerobic capacity	>106%	maximal

RPE - Rate of Perceived Exertion

THE MET SYSTEM

You may prefer to design a fitness program around the activities you already engage in such as walking, running or swimming. Or perhaps, you would like to adjust or make additions to your current program. Either way, this section will aid in applying your genetic results to create or defining your fitness program.

The Metabolic Equivalent of Task (MET) is a physiological measure expressing the energy cost of physical activities. MET is defined as the ratio of the metabolic rate (thus the rate of energy consumption) during a specific physical activity to a reference metabolic rate.

One MET equals 1 kcal/kg/hour and is roughly equivalent to the energy cost of sitting quietly.

The MET system can be thought of as an index of the intensity of activities: for example, an activity with a MET value of 2, such as walking at a slow pace (e.g. 3 km/h) would require twice the energy that an average person consumes at rest (e.g. sitting quietly). The more vigorous the activity the higher the MET value will be. Accurate MET values are available for a wide variety of activities and are an excellent way to develop and track your progress. The Compendium of Physical Activities is a comprehensive catalogue of MET intensities and can be found on the following website:

https://sites.google.com/site/compendiumofphysicalactivities/

HOW TO CALCULATE YOUR WEEKLY MET HOUR SCORE

Choose your preferred activity from the list of activities in the Tables below. The activities have been divided into light, moderate and vigorous intensities.

By means of applying the formula below, multiply the MET value of the selected activity by the actual number of hours the activity is performed to determine your MET hours.

Add all the MET hours for each of the activities for the week together, to determine your weekly MET hour score. You can now compare it to your goals and the recommended weekly MET hours, based on your current fitness level and genetic results.

MET Hours Score Calculation Example

Activity:	Swimming, sidestroke
Duration:	1 hour per session
Frequency:	3 days per week

Formula:

MET Value x Duration (in actual hours) = MET Hours

7 METs x 1 hour = 7 MET hours

7 MET hours x 3 days in a week = 21 weekly MET hours

ACTIVITIES WITH MET VALUES AND INTENSITIES

WALKING AND RUNNING	MET/60 min	INTENSITY
Walking less than 3,2km/hr on a firm surface	2	LIGHT
Walking 3,2km/hr on a firm surface	2.5	
Walking 4km/hr downhill	2.8	
Walking, 5,6kh/hr, brisk pace, firm surface	3.8	
Jogging/walking combination less than 10 min	6	MODERATE
Hiking, cross country	6	
Walking 5,6km/hr uphill	6	
Running less than 7km/hr (15 min/2km)	6	
Climbing hills, no load	6.8	
Walking, 7,2km/h, level, firm surface, very, very brisk	7	HIGH
Climbing hills with 5 to 10kg load	7.3	
Jogging	8	
Running, 8km/hr	8	
Mountain Climbing or hiking with a day pack	8	
Walking 8km/hr on a firm surface	8.3	
Climbing hills with 10 to 20kg load	8.3	
Stair climbing at a fast pace	8.8	
Cross country Running	9	
Running 10km/hr	9.8	
Walking 8km/hr uphill	9.8	
Running 12,8 km/hr	11.8	
Running marathons	13	

CYCLING	MET/60 min	INTENSITY
Cycling less than 16km/hr, for leisure	3.5	LIGHT
Cycling stationary 30-50 watts, very light to light efforts	3.5	
Cycling stationary 100 watts, light to moderate efforts	6	MODERATE
Cycling stationary general	7	HIGH
Mountain biking general	8.5	
Cycling stationary at 150 watts, vigorous effort	8.8	
Cycling 22-26km/hr, vigorous	10	
Cycling stationary at 160-200 watts, vigorous effort	11	
Cycling racing 26-30km/hr	12	
Mountain biking uphill and competitive	14	
Cycling > 32km/hr	15.8	

CONDITIONING	MET/60 min	INTENSITY
Stretching, yoga	2.5	LIGHT
Light effort abdominal crunches	2.8	
Fitball exercise	2.8	
Upper arm exercise	2.8	
Pilates	3	
Callisthenics (e.g. push-ups, sit-ups, pull-ups, lunges), moderate effort	3.8	
Tai Chi	4	MODERATE
Circuit Training, moderate effort	4.3	
Rowing, Stationary, 50 watts light effort	4.8	
Resistance (weight) training, squats, slow or explosive effort	5	
Water aerobics	5.3	
Weight lifting, vigourous effort	6	
Circuit training, including kettlebells, some aerobic movement with minimal rest, general, vigorous intensity	8	HIGH
Conditioning classes (Aerobics, vigorous)	8	
Stationary rowing, 150 watts very vigorous	8.5	
Rope jumping, fast	11	
Stationary rowing, 200 watts very vigorous	12	

WATER ACTIVITIES	MET/60 min	INTENSITY
Canoeing, rowing, 3-7km/hr, light effort	2.8	LIGHT
Diving, springboard or platform	3	
Sailing, surfing, windsurfing, general	3	
Water aerobics	5.3	MODERATE
Swimming freestyle, moderate effort	5.8	
Swimming sidestroke, general	7	HIGH
Swimming laps, freestyle, fast, vigorous effort	9.8	
Swimming, treading water, fast, vigorous effort	9.8	
Swimming breaststroke, general training or competition	10.3	
Canoeing, rowing, kayaking, competition, > 10km/hr, vigorous effort	12.5	
Swimming laps, butterfly, fast, vigorous effort	13.8	

SPORTS	MET/60 min	INTENSITY
Horse riding, walking	2.5	LIGHT
Bowling	3	
Golf, driving range	3	
Golf, walking, carrying clubs	4.5	MODERATE
Badminton	4.5	
Horse Riding, competitive	5.5	
Boxing, against a punching bag	6	
Basketball	6.5	
Soccer, casual	7	HIGH
Squash	7.3	
Boxing, sparring	7.8	
Hockey	7.8	
Tennis, singles	8	
Orienteering	9	
Soccer, competitive	10	
Martial Arts (kickboxing, judo, tai-bo, etc.)	10.3	

For MET values for other activities visit:

https://sites.google.com/site/compendiumofphysicalactivities

When designing your weekly exercise program, include injury preventing conditioning exercises and allow time for recovery after training sessions. Furthermore, consider your genetic sporting potential discussed above and incorporate the exercises that are most beneficial to your training regime and athletic performance.

Use the MET Weekly Exercise Planner below to design your workout program. Consult your Health Care Practitioner before starting any new exercise regime and stop should you feel dizzy, nauseous or experience severe shortness of breath.

MET WEEKLY EXERCISE PLANNER

DAY	ACTIVITY	MET-Value	DURATION	MET-Hours = MET Value x Duration (in hours)	TOTAL MET SCORE (for the day)
Example					
Monday	Cycling <16km/hr	3.5	1 hour	3.5	3.5
Tuesday	Cycling stationary at 150 watts, vigorous	8.8	½ hour	4.4	4.4
Friday	Cycle >32km/hr	15.8	1 hour	15.8	15.8
				Total for the week	23.7
				Weekly Goal:	24 MET Hours
				TOTAL SCORE FOR THE WEEK	

Summary of your Genetic Results

Power / Strength Higher Intensity Heart Rates (Anaerobic Predisposition)

ACE (I/D): Muscle properties	C/C
CKMM NcoI: Muscle energy availability	T/T
NOS3 (G894T): Muscle building	T/T
PPARA (Intron 7G/C): Fast twitch muscle fibres	G/G
VDR BsmI: Muscle strength	G/G
ACTN3 (R577X): "Speed Gene"	T/C
AGT (M235T): Blood vessel constriction	A/G
AMPD1 (C34T): Muscle energy	G/G
IL6 (-174 G/C): Muscle repair	G/G
PPARGC1A (Gly482Ser): Muscle fiber activation	G/G
SOD2 (Val16Ala): Mitochondrial support	A/G
VDR Fok1: Skeletal muscle function	A/G
VDR Taq1: Muscle growth	A/A

Endurance Lower Intensity Heart Rates (Aerobic Predisposition)

ADRB2 (A16G): Glucose uptake by muscles	G/G
ADRB2 (Q27E): Adrenaline release	G/G
NOS3 (G894T): Blood vessel dilation	T/T
UCP3 (55C>T): Energy regulation	G/G
ACTN3 (R577X): Muscle fiber type	T/C
CRP4 (G3872A): Exercise tolerance	C/T
ACE (I/D): Fatigue resistance	C/C
AMPD1 (C34T): ATP Energy production	G/G
CKMM NcoI: Muscle energy availability	T/T
NRF2 (A>G): Respiratory capacity	A/G
PPARA (intron 7G/C): Slow twitch muscle fibres	G/G
PPARGC1A (Gly482Ser): Energy release	G/G
VEGF (634G/C): Blood vessel formation	C/G
COL5A1 (C414T): Running economy	C/T
HFE (H63A): Oxygen transport	C/C

VO2Max Trainability (Oxygen Uptake)

ADRB2 (A16G): Adrenaline stimulated oxygen delivery	G/G
ADRB2 (Q27E): Adrenaline stimulated oxygen delivery	G/G
CRP4 (G3872A): Inflammatory cytokine	C/T
VEGF (634G/C): Oxygen delivery	C/G
AMPD1 (C34T): VO2max training response	G/G
NRF2 (A>G): VO2max trainability	A/G
PPARA (intron 7G/C): Energy regulation	G/G
PPARGC1A (Gly482Ser): VO2max trainability	G/G
TMPRSS6 (V736A): Oxygen transport	G/G

Musculoskeletal Injury Susceptibility

COL1A1 Sp1: Collagen synthesis	A/C
COL5A1 (C414T): Tendons	C/T
DBP (D432E): Vit D uptake	A/C
DBP (T>G): Vit D transport	G/T
VDR FokI: Calcium uptake	A/G
TIMP4 (55C/T): Joint health	C/C
VDR BsmI: Calcium uptake	G/G
VDR Taq1: Bone cell growth	A/A

Recovery: Oxidative Stress & Detoxification

GSTM1 (Lys173Gln): Cellular detoxification	ABS
SOD2 (Val16Ala): Neutralisation of free radicals in the mitochondria	A/G
GPX1 (Pro199Leu): Selenium-dependant free radical neutralisation	C/C
GSTT1 (Val169Ile): Glutathione and antioxidant requirements	PRS

Recovery: Inflammation & Immunity

TNFα (-308 G>A): Pro-inflammatory susceptibility	A/A
CRP4 (G3872A): Inflammation marker	C/T
APOE: Nerve regrowth following tissue damage	E3/E3
IL6 (-174 G/C): Immune response	G/G
ILR6 (481A>C): Acute inflammatory response	A/A

Energy Production during Exercise

AMPD1 (C34T): Glycolysis for ATP production	G/G
NRF2 (A>G): Energy mobilisation in cells	A/G
PPARA (intron 7G/C): ATP production	G/G
PPARGC1A (Gly482Ser): Mitochondria production	G/G

Fuel Mobilisation during Endurance Activities

ADRB2 (A16G): Fat mobilisation	G/G
ADRB2 (Q27E): Fuel substrate utilisation	G/G
PPARD (+294T>C): Fatty acid oxidation ('fat burning')	T/T
BDKRB2 (C58T): Skeletal muscle glucose uptake	C/T
FABP2 (Ala54Thr): Fatty acid oxidation	C/T

Fuel Switching during Exercise

PPARD (+294T>C): Glycogen sparing in muscles during endurance events	T/T
CYP1A2*1F: Benefit of caffeine use to stimulate fat utilisation	C/A

Lactate Threshold

ACTN3 (R577X): Lactate accumulation	T/C
VEGF (634G/C): Lactate-induced angiogenesis	C/G
AMPD1 (C34T): Lactate accumulation	G/G
PPARGC1A (Gly482Ser): Lactate clearing capability	G/G

Altitude Training

ADRB2 (A16G): Hypoxic training	G/G
NOS3 (G894T): High altitude performance	T/T
ACE (I/D): Acclimatisation	C/C
ADRB2 (Q27E): Hypoxic training	G/G
PPARA (intron 7G/C): Red blood cell production	G/G

Exercise Tolerance

BDNF (Val66Met): Endorphin response	C/C
COMT (Val158Met): Pain tolerance	A/G
CRP4 (G3872A): Exercise tolerance	C/T
AMPD1 (C34T): Exercise tolerance	G/G

Training Times

CLOCK (3111 T>C): Regulation of the circadian rhythm (the natural 24-hour biological cycle in the body)	A/G

Blood Flow

NOS3 (G894T): Vasodilation	T/T
AGT (M235T): Blood flow regulation	A/G
ACE (G>C): Circulation & blood pressure control	C/C
ACE (I/D): Blood flow regulation	I/I
BDKRB2 (C58T): Vasodilation	C/T

Nutrients

Antioxidants for Sports Performance & Recovery

GSTM1 (Lys173Gln)	ABS
GSTP1 (Ile105Val)	A/G
SOD2 (Val16Ala)	A/G
GPX1 (Pro199Leu)	C/C
GSTT1 (Val169Ile)	PRS

Collagen Requirement

GDF5 (+104T/C)	A/A
COL1A1 Sp1	A/C
COL5A1 (C414T)	C/T

Omega-3 Requirement

TNF α (-308 G>A)	A/A
CRP4 (G3872A)	C/T
BDNF (Val 66 Met)	C/C
IL6 (-174 G/C)	G/G

Iron Metabolism

HFE (C282Y)	G/G
HFE (H63D)	C/C
TMPRSS6 (V736A)	G/G

Vitamin D & Calcium Requirements

DBP (Glu416Asp)	A/C
DBP (rs2282679)	G/T
VDR Fok1	A/G
VDR BsmI	G/G
VDR Taq1	A/A

Sodium Sensitivity

ACE (I/D)	C/C
AGT (M235T)	A/G

Glutathione Utilisation

GSTM1 (Lys173Gln)	ABS
GSTP1 (Ile105Val)	A/G
GSTT1 (Val169Ile)	PRS

Caffeine Sensitivity

CYP1A2*1	C/A

Additional Information

Methodology

SNP (Single Nucleotide Polymorphism) detection takes place using a biomedical technology called polymerase chain reaction (PCR). During this process, a few copies of a piece of DNA are amplified generating an exponential number of copies of a DNA sequence. Variations in the genes, called polymorphisms, are detected and feedback on the possible (disease) associations of these variations are provided in a report format.

Glossary

Amino acids - Organic compounds that combine to form a protein.
Carrier - An individual who carries gene variants but usually does not display that trait or show symptoms of the disease.
DNA (deoxyribonucleic acid) - The molecule that encodes genetic information.
DNA sequence - The relative order of base pairs.
Gene - The fundamental physical and functional unit of heredity.
Gene expression - The process by which a gene's coded information is converted into the structures present and operating in the cell.
Gene product - The biochemical material - either RNA or protein - resulting from the expression of a gene.
Genome - All the genetic material in the chromosomes of an organism.
Heterozygote - An individual with two different alleles at one locus (position) on the chromosome pair.
Homozygote - An individual with two identical alleles at one locus (position) on the chromosome pair.
Locus (pl. loci) - The position of a gene on a chromosome.
Mitochondrial DNA - DNA inherited only from your mother.
Mutation - Any heritable change in the DNA sequence. See also polymorphism.
Nucleotide - A subunit of DNA consisting of a base: adenine, guanine, thymine or cytosine.
Polygenic disorders - Genetic disorders resulting from the combined action of alleles of more than one gene (e.g. heart disease, obesity).
Polymorphism - A difference in DNA sequence among individuals.
Protein - A large molecule composed of amino acids in a specific order - of which the order is determined by the sequence of nucleotides in the gene coding for the protein.

GENEWAY™ Disclaimer

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