



Sport Report

OPTIMAL HEALTH FOR LIFE



GENE MATRIX

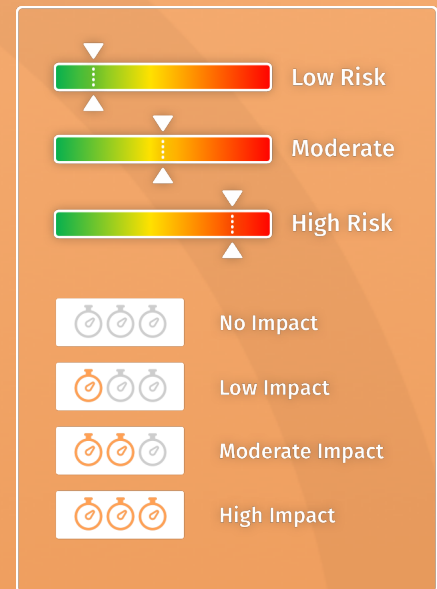
**GENOTYPE
REPORT**

NAME	NGx Sample
DATE OF BIRTH	1/1/1900
REFERRING PRACTITIONER	
DATE REPORTED	2/20/2023 11:30:27 AM
ACCESSION NUMBER	DNA013992ZA

WELCOME TO YOUR DNA SPORT REPORT

From your buccal swab sample we have used a process called the Polymerase Chain Reaction (PCR), which copies the DNA of your genes many times over so that we can generate sufficient quantities to analyse your genetic material. We then identify unique DNA sequences in some of your genes. Certain changes (polymorphisms) in these genes have been studied in detail, with evidence that correlates these polymorphisms with an individual's risk of developing certain chronic disease conditions or altered metabolic processes. Having identified the presence or absence of these polymorphisms, we are able to qualitatively assess particular areas of health risk related to the specific genes.

To make a holistic assessment of health risks, environmental factors (diet and lifestyle) need to be considered in conjunction with the accompanying genetic profile.



HOW TO READ YOUR RESULTS

The results will give the gene name and variation we tested, as well as a brief description of this gene. You will find your specific result and an explanation of how this may impact your training and/or nutritional requirements. Certain genetic variants are advantageous for athletic performance, while some variants may contribute to an increased risk for injury or a delayed recovery time. Training and nutritional recommendations that may benefit you will also be made, with any additional health recommendations indicated as well. The impact of your specific result can be identified by the DNA Sport symbols (please see the above key).

NO IMPACT

Genotype has no effects on the biological area in question.

LOW IMPACT

Genotype has mild effects on the biological area in question with a small change in responsiveness to environmental influences.

MODERATE IMPACT

Genotype has moderate effects on the biological area in question. Attention should be paid, and some dietary and lifestyle changes are recommended.

HIGH IMPACT










Genotype has significant impact on the biological area in question. Cohesive and intensive diet and lifestyle action should be taken.

YOUR GENETIC RESULTS PART 1

INJURY AND RECOVERY

We only need to look around at other individuals whom we exercise with to realize that some individuals seem to be 'injury prone', while others are never forced to skip a day of training. Additionally, some individuals are able to recover quickly from exercise and are ready to train hard again after just a day's rest whereas some individuals don't seem to 'bounce back' from hard sessions quite so quickly and need a longer break between intense training sessions. Research has revealed that certain genetic variations infer a delayed recovery from hard exercise training, while other variants put some individuals at a significantly increased risk of certain injuries. Injury and recovery are very much intertwined because being slow at recovering from heavy exercise is likely to place you at a greater risk of injury, and this increased injury risk means that you will need to incorporate appropriate recovery strategies into your training program. Delayed recovery or increased susceptibility to injury means that a balanced, well managed training program is required, with strong emphasis on recovery strategies, conditioning exercises and nutrition.

With regards to injury and recovery, three important biological systems have been well researched and are examined in the DNA Sport test: injury susceptibility (connective tissue remodeling), inflammation and oxidative stress. The table below gives your genetic results for these three categories, with gene explanations following thereafter.

AREA OF ACTIVITY	GENE	GENETIC VARIATION	RESULT	GENE IMPACT
Inflammation Sport	CRP	219G>A	C/T	
	IL6	-174G>C	G/G	
	IL6R	481A>C	A/C	
	TNF	-308G>A	G/G	
Injury Susceptibility	COL1A1	1546G>T	A/A	
	COL5A1	267C>T	C/C	
	GDF5	-275C>T	T/T	
Oxidative Stress Sport	NOS3	894G>T	G/T	
	SOD2	-28C>T (Ala16Val)	C/C	

INFLAMMATION SPORT

Inflammation is a normal immune response and an essential part of tissue healing following exercise. The release of inflammatory cytokines is controlled by various genes, however when there is a greater than normal increase in inflammatory cytokines following exercise, or a prolonged increase in these cytokines, increased recovery time is required between hard sessions in order to avoid tissue damage.

IL6 | -174G>C



Interleukin 6 is an inflammatory cytokine that stimulates an immune response to strenuous exercise. Excess release of this cytokine can lead to a chronic inflammatory state.

YOUR RESULT: G/G

The G allele does not influence post-exercise inflammation. Since you do not release excess amounts of IL6, you may have improved muscle repair after eccentric exercise. This gives you an advantage for strength and power training. Adding eccentric loading to your training regimen may be beneficial to power development.

TNF | -308G>A



Tumour necrosis factor- α (TNFA), like IL6, is a pro-inflammatory cytokine that stimulates the acute phase reaction of inflammation. Levels of TNFA increase after intensive exercise.

YOUR RESULT: G/G

Your genotype does not influence the inflammation you experience with exercise.

CRP | 219G>A



CRP increases in response to inflammation and plays a role in activating parts of the innate immune system. Regular moderate intensity exercise and favorable nutritional choices can help reduce baseline inflammatory markers such as CRP.

YOUR RESULT: C/T

The G (C) allele is linked to moderately higher levels of CRP which is associated with higher levels of inflammation. This will impact your required recovery time between training sessions. Regular moderate intensity exercise, as well as a diet low in saturated fats, can lead to improvements in CRP levels.

IL6R | 481A>C



IL6R gene encodes the Interleukin 6 receptor that mediates the action of Interleukin 6 (IL6). This gene influences the fatigue experienced following a physical exercise and the ability to recover.

YOUR RESULT: A/C

The C allele is linked to slightly higher levels of Interleukin 6 receptor (IL6R) as well as Interleukin 6 (IL6), and subsequently increases the acute inflammatory effects of exercise. It may be necessary to increase your recovery time between training bouts and sessions. It is also important to increase your anti-inflammatory nutritional support.

INJURY SUSCEPTIBILITY

Multiple stimuli, including exercise and mechanical load, can lead to connective tissue remodeling. Although remodeling may lead to physical gains, alterations in the structural properties of tissues may also lead to increased injury susceptibility. The variations examined in the DNA Sport test are linked to the ability of soft tissues to repair and remodel following tissue degradation, thus being implicated in injury risk.

COL1A1 | 1546G>T



COL1A1 is one of the major collagens in connective tissues. Altered expression of this gene may lead to injury risk due to a structural change in the properties of the tissue.

YOUR RESULT: A/A

The T (A) allele does not impact your risk of tendon and ligament injuries. However, the TT (AA) genotype has been associated with a higher risk of osteoporosis; including bone loading exercises in your exercise training as well as ensuring adequate intake of calcium and vitamin D3, is likely to reduce this risk. Also, limit caffeine intake due to its contribution to a loss of calcium.

COL5A1 | 267C>T



COL5A1 is one of the minor collagens that regulates the formation of new soft tissue fibers. Altered expression of this gene can lead to injury risk.

YOUR RESULT: C/C

The C allele does not contribute to an increased risk of injury. Individuals with the CC genotype seem to have an increased range of motion; ensure adequate strength to go along with this flexibility.

GDF5 | -275C>T



The growth differentiation factor 5 (GDF5) plays a role in the development and healing of skeletal, joint, and soft tissues. This gene influences the ability to recover from tissue damage.

YOUR RESULT: T/T

The T allele results in reduced expression of this gene. This leads to an increased risk of soft tissue injuries as well as osteoarthritis. It is important to incorporate conditioning and resistance exercises into your training regimen to try and reduce your risk of injury.

OXIDATIVE STRESS SPORT

Free radicals are a normal by-product of the biological processes that generate energy, such as those that occur during exercise. They are highly reactive with other molecules, and can damage DNA, proteins and cellular membranes. Antioxidants are free radical scavengers that interact with the free radical to ensure that it is no longer a reactive molecule. Long term regular light and moderate intensity exercise leads to an increase in antioxidant enzymes, as well as a decrease in baseline inflammatory cytokines: beneficial to exercise training, performance and optimal health.

NOS3 | 894G>T



NOS3 gene encodes the endothelial nitric oxide synthase 3 (eNOS), an essential enzyme for a healthy cardiovascular system. eNOS produces nitric oxide (NO), a small gaseous molecule involved in the regulation of vascular tone and peripheral resistance. Decreased activity of eNOS has been associated with an increase in free radicals.

YOUR RESULT: G/T

The T allele leads to a decreased activity of eNOS. This negatively affects oxidative stress and may also promote atherosclerosis. Ensure adequate antioxidant intake, as well as omega 3 fatty acids.

SOD2 | -28C>T (Ala16Val)



The SOD2 gene encodes the superoxide dismutase 2, a mitochondrial enzyme involved in the elimination of free radicals which are normally produced within cells and which are damaging to biological systems. Oxidative stress during intensive training can lead to muscular fatigue and antioxidant enzymes are thus very important for physical performance.

YOUR RESULT: C/C

The C allele is linked to higher levels of oxidative stress. This could be a risk for developing long term disease if fruit, vegetable and other antioxidant intake is not adequate. Low and moderate intensity exercise training can also help to increase baseline levels of antioxidant enzymes.

YOUR INJURY RISK

Based on our analysis and interpretation of your genetics, your DNA Sport tests indicate that it is likely that you have a moderate risk of a soft tissue injury. This means that you will need to be careful, ensuring that your training volumes and intensities are appropriate to your fitness level and that you engage in some degree of injury-preventing conditioning exercises. Nutrition also plays a role in injury prevention.



RECOMMENDATIONS

Your genetic results reveal that you may need to be taking some preventative steps to try and anticipate the strains that will occur on your musculoskeletal system with training. We call this conditioning work 'prehabilitative training' – i.e. injury prevention. Resistance and flexibility training are the cornerstones for prehabilitation, and rehabilitation if an injury occurs. They include classical weight training, plyometrics, Pilates, yoga and specific exercises that have been designed to target particular injury risks. If you are training regularly it would be worthwhile doing at least one or two sessions per week which are focused on general conditioning, helping to reduce your injury risk. If you are an elite athlete or focused on a specific sport, consider setting up a practice of sport-specific conditioning exercises 3-4 times per week. It is important to consider the most common musculoskeletal injuries that occur in your particular sport and take specific advice from a coach or exercise professional who specializes in your event. For example: runners are prone to Achilles tendonitis, calf strains, hamstring strains, patellar tendonitis, IT band syndrome; cyclists are prone to knee, back and neck pain (although a good bike set up can make a large difference); swimmers are prone to swimmers shoulder and breast-stroke knee. With regards to nutrition, ensure adequate intake of vitamin C and iron as these are important for collagen turnover. A good protein source is important for amino acid building and should be taken in after intense training sessions.

YOUR RECOVERY

Based on our analysis and interpretation of your genetics, your DNA Sport tests indicate that it is likely that you are able to recover quickly from hard exercise. This means that you have the capacity to undertake a heavy training load with frequent inputs of exercise. However, it should be noted that hard training comes from a mixture of good genetics and slowly building a training foundation over the course of many years. If you have already been training at a high level for some years, take this as an indication that your body can theoretically handle high loads of exercise under ideal conditions. Otherwise, it is suggested that you build up to this level slowly, taking into account your risk for injury.



RECOMMENDATIONS

Due to your likely moderate rate of recovery from hard exercise sessions, if you would like to gain the best returns from your training and optimize performance in your chosen sport, we recommend that you follow some planned recovery strategies. Recovery is classically considered as the time between sessions. According to training theories, we require two to three days between hard training sessions. Since you have a moderate recovery rate, once a training base is established, you may expect to hit two to three hard sport-specific sessions per week. Other steady recovery and conditioning sessions can be built around these big two to three sessions. If you are a seasoned athlete, you could potentially progress to a once per day routine with an additional session on one or two days of the week. Always allow one full day off per week. Recreational athletes with other commitments might wish to max out at a total of five sessions per week. In addition to carefully planning your recovery times between sessions, you should also consider these following factors. Sleep is vitally important and you should look to obtain enough sleep so that you feel refreshed upon rising in the morning. This might be +/- eight hours at night and a nap in the day is especially useful for optimizing recovery. Managing your nutrition is also important for optimal recovery and keeping the inflammatory process under control. Since inflammation influences recovery rates, you should look to consume mostly anti-inflammatory and antioxidant foods in your diet and avoid those that are pro-inflammatory. A diet low in carbohydrates can help to reduce post exercise inflammation, however, consuming carbohydrate based beverages during exhaustive exercise can help to reduce levels of inflammatory cytokines such as IL6 and CRP. Consuming a good protein source after exercise is also known to decrease inflammation and assist recovery. Antioxidants can also be consumed in a wide variety of foods, especially fruits and vegetables, as well as green tea. Focus on fruits and vegetables of many different colors; green leafy vegetables and cruciferous vegetables have particularly good antioxidant properties. Avoid smoking of any kind.

YOUR GENETIC RESULTS PART 2

PERFORMANCE

It is well established that a high percentage of the variance observed in athletic status can be explained by genetic factors. These genetic factors, as examined in your DNA Sport test, can determine how well you will respond to certain types of exercise training. Although both aerobic training as well as strength and weight training are important for overall health and fitness, the ratio of these types of training should vary between individuals, even between those working towards the same goals. The overall results of this genetic test will enable you to focus your training towards the type of exercise that is going to give you the best outcomes for your hard work, whether that be aerobic or power type training.

AREA OF ACTIVITY	GENE	GENETIC VARIATION	RESULT	GENE IMPACT
Blood Flow and Respiration	ACE	I/D	G/C	
	AGT	Met235Thr	A/G	
	BDKRB2	-275C>T	C/T	
	VEGFA	94C>G	G/G	
Energy Mobilisation	GABPB1	A>G	A/A	
	PPARA	1160-396G>C	C/C	
	PPARGC1A	1444G>A (Gly482Ser)	G/G	
Fuel Metabolism	ADRB2	79C>G (Gln27Glu)	G/G	
	ADRB2	46A>G (Arg16Gly)	G/G	
	CYP1A2	-163C>A	C/A	
	TRHR	rs7832552	C/C	
Musculoskeletal Properties	ACTN3	R577X	C/C	
	VDR	Taq1 C>T	T/T	

BLOOD FLOW AND RESPIRATION

Sporting performance is largely dependent on oxygen diffusion, and thus the vascular and pulmonary systems. Oxygen transport to the musculature is the key determinant of aerobic capacity and resistance to fatigue.

ACE | I/D



ACE is a potent vasoconstrictor in the renin-angiotensin system. This enzyme is key in blood pressure regulation. ACE impacts aerobic capacity, muscular strength and lean body mass.

YOUR RESULT: G/C

The ID (CG) genotype contributes to both aerobic capacity and muscular strength. You are likely to have gains in aerobic capacity from low and moderate intensity exercise, as well as gains in power from strength and interval training.

AGT | Met235Thr



This gene is important in the regulation of electrolyte and body fluid balance, as well as blood pressure. Upregulation of AGT potentially leads to vasoconstriction and increased blood pressure. This gene contributes to the development of power.

YOUR RESULT: A/G

The TC (AG) genotype does not impact sporting performance.

BDKRB2 | -275C>T



Bradykinin is a vasodilator that acts via the bradykinin B2 receptor. BDKRB2 is involved in blood pressure regulation, having the opposite effect to ACE.

YOUR RESULT: C/T

The T allele is associated with a moderate advantage for aerobic exercise. It increases expression of this gene, increasing vasodilation which is believed to increase muscle contraction efficiency.

VEGFA | 94C>G



Vascular endothelial growth factor (VEGF) is a protein involved in the formation and growth of new blood vessels. Therefore, the levels of VEGF impact blood flow and oxygenation - these factors influence muscle efficiency and aerobic capacity.

YOUR RESULT: G/G

This genotype does not impact sporting performance.

ENERGY MOBILISATION

In order to avoid fatigue during exercise the rate of energy production needs to match the rate of energy consumption. The mitochondria are the key sites of energy production (in the form of ATP) for muscle fibers, and the oxidative capacity of muscle fibers is directly linked to the formation of new mitochondria.

GABPB1 | A>G



Nuclear factor (erythroid-derived 2)-like 2 (NRF2) is a protein that serves as a regulator of the body's antioxidant response against oxidative damage triggered by injury and inflammation. This protein is also important in the formation of new mitochondria: the 'power house' of the cell where energy is produced. NRF2 improves respiratory capacity and the rate of energy production during exercise.

YOUR RESULT: A/A

The A allele does not impact sporting performance. However, it must be noted that the AA genotype is present in 98% of the population, and only 2% carry a G allele.

PPARA | 1160-396G>C



Peroxisome proliferator-activated receptor alpha (PPARA) is involved in the uptake, utilisation and break down of fatty acids to ATP - the main source of energy during prolonged exercise.

YOUR RESULT: C/C

CC is associated with greater strength with training due to the ability to build more muscle mass and have greater single muscle contraction power. You are likely to have less Type I (slow twitch) muscle fibers and more Type II (fast twitch) fibers. You should monitor your heart rate during intensive training.

PPARGC1A | 1444G>A (Gly482Ser)



Peroxisome Proliferator-Activated Receptor Gamma, Coactivator 1 Alpha (PPARGC1A) plays an essential role in energy regulation. It is expressed in tissues that have high energy demands and is therefore abundant in mitochondria and associated with aerobic capacity. PPARGC1A is also involved in the exercise-induced increase in mitochondria.

YOUR RESULT: G/G

The GG genotype is linked to increased expression of this gene as well as Type I (slow twitch) muscle fiber specialization. It is also associated with greater mitochondrial biogenesis at baseline and in response to aerobic training. This gives you an advantage for increased aerobic capacity.

FUEL METABOLISM

Carbohydrates and fats are the main contributors to the fuel supply that is necessary to perform exercise. These sources are converted to energy, in the form of ATP, when required. Protein is generally involved in the maintenance and remodeling of tissues rather than an energy source to fuel muscles.

CYP1A2 | -163C>A



Caffeine is a central nervous system and metabolic stimulant used to reduce physical fatigue. In athletics, moderate doses of caffeine have been known to improve both sprint and endurance performance. CYP1A2 is one of the main enzymes that catalyzes the oxidation of caffeine in humans.

YOUR RESULT: C/A

This indicates that you have a reduced ability to metabolize caffeine. A moderate to high intake of caffeinated beverages, such as coffee, is associated with increased risk of heart disease. It is recommended that you rather opt for decaffeinated options. In terms of performance benefits, you may need to take caffeine more than an hour before the start of a race in order to gain from the effects.

ADRB2 | 46A>G (Arg16Gly)



ADRB2 regulates cardiac, pulmonary, vascular, endocrine and central nervous system functions. Adrenaline acts via ADRB2 to maintain blood glucose levels during prolonged exercise by promoting glycogenolysis. Arg16Gly is involved in the modulation of cardiac output during exercise through vasodilation.

YOUR RESULT: G/G

The GG genotype does not impact sporting performance. However, it contributes to persistent bronchodilation following exercise which helps to speed up recovery.

ADRB2 | 79C>G (Gln27Glu)



Gln27Glu within ABRB2 is associated with aerobic capacity and the ability to lose weight as a result of exercise.

YOUR RESULT: G/G

The G allele does not impact sporting performance. If you struggle with weight loss - GG indicates that there may be a need to vary exercise intensities in order to burn fat. You are likely to benefit from mixed aerobic and anaerobic training. If you wish to gain a more comprehensive understanding of your weight loss responsiveness to exercise, we recommend performing the DNA Diet test.

TRHR | rs7832552



Thyrotropin releasing hormone receptor (TRHR) stimulates the release of thyroid hormones T3 and T4 leading to an increased metabolic rate which is required to mobilize fuels during exercise. The TRHR gene has been linked to lean body mass.

YOUR RESULT: C/C

This genotype does not impact sporting performance.

MUSCULOSKELETAL PROPERTIES

The properties of the musculoskeletal system, including bones, muscles, cartilage, tendons, ligaments and joints, greatly affect our ability to perform. Although these tissues can be potentially altered with training, our genetics form the basis of the structural properties of these tissues.

ACTN3 | R577X



ACTN3 is only present in Type II (fast twitch) muscle fibers and greatly influences power development. ACTN3 also plays a role in muscle fiber type specialization, diameter and metabolism.

YOUR RESULT: C/C

The RR (CC) genotype is linked to a greater percentage of fast twitch muscle fibers. Along with muscle growth, you are likely to have great gains in strength, speed and power with training.

VDR | Taq1 C>T



Activation of vitamin D receptor (VDR) leads to the maintenance of calcium and phosphorus levels in the blood and bones, which is necessary for bone formation and replacement, and the preservation of bone mineral density. VDR has been linked to muscle strength.

YOUR RESULT: T/T

The TT genotype does not impact sporting performance and is unlikely to influence bone mineral density.

YOUR ATHLETIC POTENTIAL

The performance potential graph gives you an indication of your genetic “score” as a potential of the total “aerobic” and “power” points available.



Based on our analysis and interpretation of your genetics, your DNA Sport tests indicate that to gain the best results from your training, you should primarily focus on strength, speed and power training. Therefore, you are likely to benefit from including short-duration, high-intensity exercises into your training regimen. This type of training relies on the “anaerobic” energy system. Generally, this type of training focuses on a large power output (high intensity) over a short period of time. You should also include long duration, light and moderate intensity aerobic exercise in your training as this is important for cardiac health, but your results indicate that you are likely to get great improvements and returns from stimulating your anaerobic system. Remember that there are many variables that influence our success with regards to training and performance; genetics is one of these variables that should be used to understand the total outcome.

KEY TRAINING PRINCIPLES

Your genetic results indicate that you will likely see improvements and gain the greatest returns with strength, speed and power-based anaerobic exercises. Your training should ideally incorporate fast-paced high intensity work. In addition, inclusion of some low and moderate intensity training as well as conditioning should be incorporated in order to stimulate a range of energy systems for a well-balanced fitness. The types of training to include are sprinting and interval training, weight training, power training and plyometrics. Sprint and interval training can vary from 5 x 4-minute repeats at a very hard pace to 10 x 20-second efforts flat out and can be adopted for running, cycling, swimming or similar cardio exercises. Weight training may include conventional free weights, machines or power cleans and snatches. Power-based plyometric exercises are also important for individuals wanting to develop explosive strength and speed. Remember to include an easy pace warm up before sessions, as well as cooling down sufficiently afterwards. With weight training, it is also important to start with developing basic muscular strength first, and slowly build up to heavy weights in order to avoid injury. Your training will however need to be tailored depending on your goal, but always bearing in mind that your success is likely to come from shorter duration, high intensity sessions. The strength, speed and power that you gain from this type of training will be of great benefit to you in short to middle distance events, but if you are involved in a particular sport, you need to be aware of the importance of combining this training with sport-specific training. It is also important to compliment this training with aerobic exercise as well as conditioning. Even if you are training for power performance, regular cardiovascular training is important for general health and overall fitness; this can be gained from repeated sprint type exercising or long duration-moderate intensity exercise. Resistance training, core-stability, flexibility, general conditioning and sport-specific conditioning are all important parts of fitness, optimal performance and injury prevention. Remember to efficiently manage your recovery time between sessions in order to avoid superfluous fatigue and injury. The following table refers to the various levels of cardio training. As someone who has good power potential, we recommend that you focus your efforts on the moderate to high intensity sessions such as Levels 4 to 7. Your core sessions should involve sprint training and strength- to power-based weight training.

SUPPLEMENTARY INFORMATION

MEASURING YOUR THRESHOLD HEART RATE AND SETTING YOUR TRAINING ZONES

Perform a solid warm-up, and then do a 30 minute time trial (all out) on a relatively flat course. Record your average heart rate for the final 20 minutes of the time trial. This is your LTHR. To set your zones, your LTHR is the figure that should go between Level 4 and 5 (100%) in the cardio table above. To work out the other zone heart rates, simply multiply the LTHR by the percentages given.

CARDIO ZONES TRAINING TABLE

The levels referred to in the cardio training table below represent zone training that can be done either with a Heart Rate (HR) Monitor or simply by your Rate of Perceived Exertion (RPE). You will need to test yourself for your Threshold Heart Rate if you wish determine your training levels with a heart rate monitor (see below). RPE is simply a 0-10 scale of how you perceive a training session to be - 0 being nothing and 10 being maximal output. Levels 1 to 4 are considered endurance style training, whereas above level 4 and above is used in short duration speed and interval training exercises.

LEVEL	INTENSITY	% OF THRESHOLD HR	RPE
1	RECOVERY	<81%	<2
2	AEROBIC	81-89%	2-3
3	TEMPO	90-93%	3-4
4	SUB-THRESHOLD	94-99%	4-5
5	SUPRA-THRESHOLD	100-102%	6-7
6	AEROBIC CAPCTIY	103-106%	>7
7	ANAEROBIC CAPACITY	>106%	MAXIMAL

Approved
By:

Name of Laboratory Director

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