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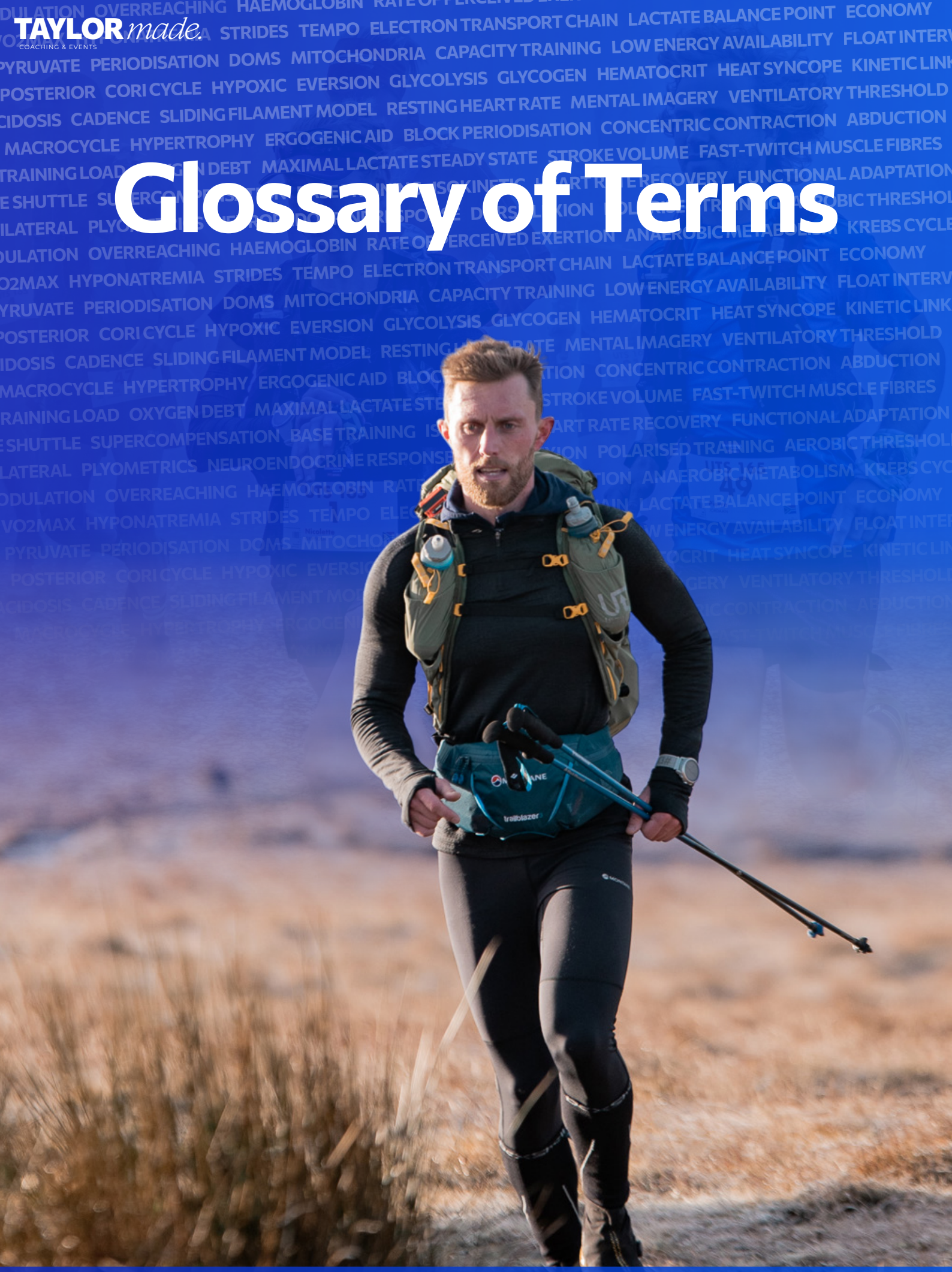
Glossary of Terms



taylormadecoaching.uk taylor@taylormadecoaching.uk +44 (0)7973249691 @taylorchristaylor TaylorMade Coaching TaylorMade Coaching & Events

ABDUCTION: Movement away from the midline of the body. Opposite of adduction.

ACCLIMATISATION: Adaptation of the body to an environmental extreme (e.g. heat, cold, altitude).

ACETYL-COA: The major fuel for the oxidative processes in the body. Acetyl-CoA is derived from the breakdown of glycogen, glucose, and fatty acids. It is broken down and used for energy production in the Krebs cycle.

ACIDOSIS: A disturbance of the normal acid-base balance in the body. Acidosis occurs when excess acids accumulate causing a fall in pH (for example, when hydrogen ions accumulate in the muscles and blood during high-intensity exercise).

ACTIN: A protein that forms the contractile filaments of muscle cells (along with myosin).

ADAPTOGEN: A name used for substances that are considered to help the body adapt to stress. Typically herbs, roots, and other plant substances (such as mushrooms).

ADDUCTION: Movement toward the midline of the body. Opposite of abduction.

ADENOSINE TRIPHOSPATE (ATP): A molecule that is responsible for storing and releasing energy in the body. ATP supplies the energy for muscle contractions when its chemical bonds are broken. It is generated in the mitochondria of cells and can be produced both aerobically and anaerobically. As the body stores only a small amount of ATP at any given time, it must be continually regenerated on a cellular level. The rate at which ATP can be resynthesised determines the work rate of which the body is capable.

AEROBIC: Occurring in the presence of oxygen.

AEROBIC BASE: The physiological state in an endurance athlete brought about by extensive training at low to moderate intensities. This training enhances the ability of the trained muscles to produce energy aerobically, particularly using fat as the primary fuel. Aerobic base training makes up the vast majority of an endurance athlete's annual training volume. It supports the higher-intensity training by allowing the athlete to recover faster from intense training and races.

AEROBIC DEFICIENCY SYNDROME (ADS): A condition common in endurance athletes that conduct too much training at middle to high-intensity efforts. An over-emphasis on high-intensity training causes an increased development of the anaerobic glycolytic metabolic pathway and a reduced development of the aerobic metabolic pathway in the affected muscles. If this training state persists long enough, the athlete will see a lowering of their Aerobic Threshold.

AEROBIC METABOLISM: The cellular respiration process that takes place within the mitochondria. The end products of the breakdown of fat, carbohydrate, and protein are combined *with oxygen* to produce ATP. Aerobic metabolism is the primary energy production pathway for endurance events lasting longer than about two minutes. Also known as aerobic respiration and oxidative metabolism.

AEROBIC THRESHOLD (AET): The uppermost intensity of exercise where the production of ATP begins to be dominated by glycolysis rather than by the oxidation of fats. At this point, blood lactate begins to rise above the resting level (about 2mmol/L). Another marker of Aerobic Threshold is the depth and pace of ventilation. When conversation can no longer be maintained at a normal cadence, the First Ventilatory Threshold (VT1) has been reached and the Aerobic Threshold is likely to have been crossed. AeT is an important physiological marker of intensity for endurance athletes because it marks the upper level of the most important training zone for developing aerobic capacity (the top of Zone 2). This marker is highly trainable. It can be measured by both pace and heart rate at Aerobic Threshold. Top endurance athletes can have an AeT that is within 10% (or less) of their Anaerobic (or Lactate) Threshold. Also known as LT1 (First Threshold).

AGONIST: Muscle (or muscles) that are *primarily* responsible for movement around a joint. For example, the quadriceps are agonists that extend the leg. Also known as a prime mover.

ALL-OR-NONE PRINCIPLE: In physiology, the "all-or-none" law states that a nerve or muscle cell either responds to a stimulus completely, or not at all (regardless of the strength of the stimulus). This means that a muscle fibre will only contract if the stimulus it receives is strong enough, and if the stimulus reaches the required threshold, the muscle fibre will contract to its maximum capacity.

ALVEOLI: Air sacks in the lungs that represent the end of the respiratory tract. The alveoli are where the lungs and the blood exchange oxygen and carbon dioxide during the process of breathing in and breathing out.

AMENORRHOEA: The absence of at least three successive menstrual cycles. Exercise amenorrhoea is a component of the female athlete triad and can serve as a warning sign of inadequate energy availability.

ANABOLIC: The metabolic process of combining smaller molecules into larger ones. Training has its effect on the body due to the anabolic processes it stimulates. The synthesis of protein that results in new structures within the body is an example of anabolism. Hormones that stimulate protein synthesis are known as anabolic steroids.

ANAEROBIC: Occurring in the absence of oxygen. This is a slight misnomer as being in an anaerobic state typically has more to do with a lack of oxygen *utilisation*, rather than it not being present.

ANAEROBIC METABOLISM: The cellular respiration process that takes place outside the mitochondria but within the muscle cell, whereby energy is produced to fuel muscle contractions *without the use of oxygen*. Two types of anaerobic metabolism

can occur. For very short bouts of very high-intensity exercise (ten seconds or less), high-energy phosphate fuels stored in the muscle cell as ATP and creatine phosphate can be used to produce energy for muscle contractions. For longer bouts of high-intensity exercise (up to two minutes), the breakdown of glucose through anaerobic glycolysis provides the energy for ATP synthesis.

ANAEROBIC POWER ENDURANCE: Endurance of maximal effort sustainable for less than sixty seconds. This training method comprises a tiny segment of the overall volume of an endurance athlete's annual training. However, it is useful for developing sport-specific strength because it requires the recruitment of a much larger muscle mass than regular endurance training.

ANAEROBIC THRESHOLD (ANT): The lowest intensity of exercise at which the rate of lactate production increases faster than the rate of lactate removal. AnT typically occurs at blood lactate concentrations of about 4mmol/L. Above this intensity, lactate levels in the blood begin to rise. The greater the intensity above AnT, the greater the rise in blood lactate. Also known as Lactate Threshold (LT), LT2 (Second Threshold), and Maximal Lactate Steady State (MLSS).

ANAEMIA: A condition defined by an abnormally low blood haemoglobin content, resulting in a lowered oxygen carrying capacity. Anaemia is often caused by a lack of iron in the diet and can be treated with iron supplements and by consuming iron-rich foods.

ANTAGONIST: Muscle (or muscles) that act in opposition to the agonist muscle (or muscles). For example, when the quadriceps flex to extend the leg (the *agonists*), the hamstrings relax and lengthen to allow the movement (the *antagonists*).

ANTERIOR: Anatomical directional term referring to the front (or toward the front) of the body. Opposite of posterior.

ARTERIES: Blood vessels that carry oxygenated blood away from the heart to the body.

ATROPHY: A reduction in muscle mass, often caused by prolonged inactivity. Opposite of hypertrophy.

AUTONOMIC NERVOUS SYSTEM (ANS): The component of the peripheral nervous system that regulates *involuntary* bodily functions, such as breathing, the heartbeat, and digestive processes. The ANS consists of two nervous systems, sympathetic and parasympathetic, that serve to self-regulate the body.

AVERAGE DAILY METABOLIC RATE (ADMR): The average energy expenditure over 24 hours. Includes the Basal Metabolic Rate (BMR), as well as the energy used during daily activities and food digestion.

BALLISTIC STRETCH: A type of stretching that uses momentum to force a muscle beyond its normal range of motion. Typically involves bouncing, or rapid movements. Ballistic stretching carries a high potential for injury and should be conducted cautiously.

BASAL METABOLIC RATE (BMR): The minimum energy expenditure required to perform basic (basal) life-sustaining function. Also known as Resting Metabolic Rate (RMR).

BASE TRAINING: The training period wherein the athlete focuses on developing aerobic capacity and endurance. Characterised by low to medium intensity and steady-state workouts.

BILATERAL: Movement by both sides of the body. For example a barbell curl, where both arms are involved

and both biceps produce force to lift the weight. Opposite of unilateral.

BIOMECHANICS: The study of the structure, function and motion of the mechanical aspects of the human body.

BLOCK PERIODISATION: A structured training approach that divides annual training into distinct blocks or phases. Each phase focuses on developing one physiological adaptation at a time.

BLOOD LACTATE ANALYSER: A device that analyses a small blood sample to determine the level of lactate within the blood. Used to assess the intensity of exercise.

BODYWEIGHT: The resistance to movement provided only by a person's bodyweight (such as a pull-up or a push-up).

BURNOUT: A state of physical, mental, and emotional exhaustion. Often an indication of overtraining in athletes. Burnout is typically accompanied by a decline in athletic performance and can result in mood changes, decreased motivation, frequent injuries, and regular illnesses/infections.

CADENCE: The total number of steps an athlete takes per minute whilst running. Also known as stride rate, stride frequency, or foot turnover.

CAPACITY TRAINING: Training that improves the long-term performance *potential* of an athlete. Capacity training typically includes easy runs, long runs, and aerobic workouts. These training sessions improve an athlete's long-term *potential* by stimulating structural adaptations within the body (for example, more dense and numerous mitochondria, larger capillaries, and a stronger, more muscular heart).

CAPILLARIES: The smallest blood vessels in the body. Capillaries increase in density based on how much blood supply is needed in a particular area. They are found in the tissues of the human body and transport blood, along with the nutrients and oxygen that it carries, into contact with the organs and muscles.

CARBOHYDRATES: An organic compound made up of carbon, hydrogen, and oxygen only, in a ratio of 1:2:1. Carbohydrates are one of the three principal types of nutrient used for energy production by the body. Carbohydrates are often classified as simple and complex. The classification depends on the chemical structure of the food, and how rapidly the sugar is digested and absorbed by the body. In terms of dietary make-up, the carbohydrate group comprises mainly grains, fruits, and starches.

CARBOHYDRATE LOADING: Consuming additional carbohydrates in the days leading up to a race (typically alongside an associated decrease in training volume). The goal of carb loading is to maximise endurance performance by increasing the muscle's glycogen stores. The greater the glycogen stores, the longer aerobic activity can last.

CARDIAC DRIFT: The natural increase or upward drift in heart rate that occurs during long-duration exercise, despite exercise intensity remaining the same.

CARDIAC OUTPUT: The volume of blood being pumped out of the heart in one minute. Cardiac output is calculated by multiplying stroke volume (the volume of blood pumped from the heart in one beat) with heart rate (the number of times the heart beats per minute).

CATABOLIC: The metabolic process of breaking larger molecules into smaller one's for the release of energy (for example, glycogen to glucose, or proteins to amino acids).

CENTRAL NERVOUS SYSTEM (CNS): The CNS is a *voluntary* nervous system, meaning it requires conscious thought to be activated. The brain sends a signal to the motor neurons that innervate muscle fibres, thus producing skeletal muscle contractions.

CIRCUIT: A strength workout during which an athlete completes one set of several exercises in quick succession before returning to the first exercise and repeating the circuit. Can be repeated multiple times with various rest periods as needed to stimulate different training effects.

CIRCUMDUCTION: The combination of abduction, adduction, flexion, and extension. For example, moving the arm in a circle at the shoulder joint.

CONCENTRIC CONTRACTION: Shortening of a muscle that produces force. For example, the lift phase of a bicep curl is a concentric contraction. Opposite of concentric contraction.

CONTRALATERAL: On the opposite side of another structure. Lifting the right arm is contralateral to the left leg.

CORE: Muscles that are involved in stabilising and providing support to the pelvis and spine. Core muscles include: rectus abdominis, external obliques, internal obliques, transverse abdominis, erector spinae, hip flexors (psoas), and gluteal muscles. All athletic movements involve the core in either a static, stabilising, or dynamic role.

CORI CYCLE: The metabolic pathway in which lactate produced during anaerobic glycolysis in the muscles is transported to the liver, converted to glucose (via gluconeogenesis), and returned back to the muscles to be metabolised again. Also known as the lactate or lactic acid cycle.

CREATINE: A compound synthesised from amino acids that is the precursor of creatine phosphate, an important anaerobic energy source for high-intensity exercise. Creatine is produced naturally in the body, but is also a popular dietary supplement.

CREATINE PHOSPHATE (CP): A source of high-energy phosphate stored in the skeletal muscles. The CP reserve is small, lasting only five to eight

seconds of an intense effort. Creatine phosphate can anaerobically donate a phosphate group to ADP to form ATP for muscular contraction. During periods of low-intensity exercise, excess ATP can be used to resynthesise CP by donating a phosphate group to creatine to form creatine phosphate (a process known as phosphorylation). This continual give-and-take mechanism allows CP to replenish and be available for repeated bouts of high-intensity work. Also known as phosphocreatine (PCr).

CRITICAL VELOCITY (CV): The maximum speed an athlete can maintain for an extended period of time (approximately 30 minutes). Critical velocity marks the point at which the rate of oxygen delivery is able to match the rate of oxygen uptake by the working muscles. Running at speeds above CV accumulates fatigue at a much faster rate, and the maximum sustainable running time declines inexorably. Also known as Critical Speed (CS).

CROSS TRAINING: Any cardiovascular exercise that is performed for the purpose of training that is not running (e.g. cycling, swimming).

CYTOSOL: The intracellular fluid in which the various cell structures live. Glycolytic metabolism takes place in the cytosol. Aerobic metabolism takes place within the mitochondria, which in turn lie within the cytosol.

DEEP: Anatomical directional term used to describe a structure that is further away from the surface of the body than another structure (for example, bone is deep to skin). Opposite of superficial.

DELAYED ONSET MUSCLES SORENESS (DOMS): Muscle pain, stiffness, and tenderness that typically appears 12-24 hours after strenuous exercise, reaches it's peak after 24-48 hours, and gradually subsides within a week. Caused by microscopic tears in muscle fibres due to unaccustomed physical activity (primarily by performing *eccentric* muscle contractions).

DEPRESSION: Downward movement of a body part.

DETRAINING: Periods of substantially reduced activity or a lack of physical activity. Correlates with a decrease in fitness level.

DIAPHRAGM: The diaphragm is a dome-like sheet of muscle located between the thoracic and abdominal cavities and is responsible for the increase and decrease of lung size when inhaling (contraction of diaphragm) and exhaling (relaxation of diaphragm), respectively. The diaphragm also provides lumbar stability by working with the other inner unit core muscles.

DIAPHRAGMATIC BREATHING: Also known as deep breathing, diaphragmatic breathing uses the diaphragm muscle to expand the abdomen, which encourages full oxygen exchange. Correct diaphragmatic breathing is characterised by a rising *stomach* during inhalation (as opposed to a rising *chest*).

DISTAL: Anatomical directional term referring to structures further away from the point of attachment and further from the centre of the body (for example, the hand is distal to the elbow). Opposite of proximal.

DORSIFLEXION: Movement that decreases the angle between the lower leg and foot. Walking on your heels results in the feet being dorsiflexed. Opposite of plantar flexion.

DYNAMIC STRETCH: Stretching that incorporates movement, typically involving joints and muscles going through a full range of motion (e.g. walking lunges, high knees, butt kicks). Opposite of static stretch.

ECCENTRIC CONTRACTION: Lengthening of a muscle while under tension, which can cause damage to some of the myofibres. Typically used as a braking force to counteract a concentric contraction. For example, the recovery phase of a bicep curl (lowering the weight) is an eccentric contraction. Downhill running also has a significant eccentric component. Opposite of concentric contraction.

ECONOMY: The volume of oxygen the body uses when running at a given speed or intensity. Running economy is a measure of efficiency. It is a multi-factorial concept that represents the sum of metabolic, cardiorespiratory, biomechanical and neuromuscular efficiency. Economy varies with speed and modality. High running economy on flat surfaces does not directly translate to high running economy while running uphill. Biomechanical running economy is highly trainable and can be improved by performing drills that promote more efficient movement patterns.

ELECTROLYTES: Electrolytes regulate the body's fluids, helping to maintain a healthy blood pH balance and creating the electrical impulses essential to all aspects of physical activity, from basic cell function to complex neuromuscular interactions needed for athletic performance. The kidneys work to keep the electrolyte concentrations in the blood constant despite changes in the body. One of the many important electrolytes is sodium.

ELECTRON TRANSPORT CHAIN (ETC): Located in the inner membrane of the mitochondria, the electron transport chain is a series of proteins and molecules that create an electrochemical gradient that leads to the creation of ATP. It is the last phase of oxidative phosphorylation and is responsible for the majority of ATP generation.

ELEVATION: Upward movement of a body part.

ENDURANCE: The ability to resist fatigue during exercise. For high-intensity exercise, endurance is measured in minutes, whereas in low-intensity exercise, endurance is measured in hours or even days. Endurance training helps an athlete increase the time to fatigue at a given intensity.

ERGOGENIC AID: Any technique, supplement, or substance aimed at enhancing physical athletic performance (for example, caffeine is an ergogenic aid).

EXCESS POST-EXERCISE OXYGEN CONSUMPTION (EPOC): The oxygen intake that continues after exercises ceases. The purpose of EPOC is to eliminate oxygen debt.

EVERSION: A type of foot movement that involves turning the sole of the foot outward, away from the midline of the body. Opposite of inversion.

EXTENSION: Movement that increases a joint angle. For example, the elbow joint is extended when the forearm is straightened out. Opposite of flexion.

FARTLEK: Swedish for 'speed play', fartlek is a form of unstructured speedwork training that involves regular changes in pace. Fartlek sessions are an effective method of combining speed and endurance training in one workout. The mixed effort reps reflect the reality of racing, and the continuous nature of fartlek training forces your body to recover on the move.

FASCIA: A web of connective tissue that surrounds all muscles, bones, nerves and blood vessels. Fascia has a significant affect on posture and muscle balance. Restricted fascia creates pain and muscle dysfunction.

FAST-TWITCH (FT) MUSCLE FIBRES: Often referred to as Type II fibres, fast-twitch muscle fibres contract more rapidly and with greater force than slow-twitch muscle fibres. They are larger in cross section, have lower mitochondrial density, and rely more heavily on glycolytic metabolism for ATP production. They have less endurance than slow-twitch fibres, but a certain class of FT fibres, called FTa, can be trained for more endurance.

FAT: A diverse group of chemical compounds that are insoluble in water. Fats can be categorised as saturated, unsaturated, and trans fats. The chemical bonds in fat allow it to store almost twice the chemical energy per unit of mass than carbohydrates and protein. Because of this, fats provide a large reservoir of energy for low to moderate intensity exercise. The primary location for fat storage within the body is adipose tissue (body fat). The majority of the adipose tissue that is used for energy is called subcutaneous fat (below the skin).

FEMALE ATHLETE TRIAD: An interrelationship of menstrual dysfunction (amenorrhoea), low energy availability (LEA, with or without an eating disorder), and decreased bone mineral density (osteoporosis). Relatively widespread among young female endurance athletes. Now more commonly referred to as Relative Energy Deficiency in Sport (RED-S).

FERRITIN: A protein that is used to store iron. Ferritin is mostly found in the liver, spleen, and bone marrow. Soluble ferritin is released from cells into the blood plasma in direct proportion to cellular ferritin content. Hence, a ferritin blood test can be used to indicate the status of the body's iron stores.

FKT: Fastest Known Time.

FLEXION: Movement that decreases a joint angle. For example, the elbow joint is flexed when the arm is bent, bringing the forearm closer to the upper arm. Opposite of extension.

FLOAT INTERVAL: A recovery interval which is performed at a slower pace than the repetition, but at a faster pace than a typical rest interval (up to a moderate effort level). Float intervals allow for partial recovery while still keeping the heart rate elevated and improve efficiency by forcing the body to recover on the move.

FREQUENCY: The number of times each week that

an exercise routine is completed.

FRONTAL PLANE: Divides the body into front and back halves. Stepping to the side is a movement in the frontal plane.

FUNCTIONAL ADAPTATION: The physiological changes that occur in response to training, which improve performance and efficiency. An example of a functional adaptation is an increase in mitochondrial density stimulated by performing regular low-intensity exercise.

GASTRIC EMPTYING: The rate at which substances (food and fluids) leave the stomach and enter the small intestine. A high gastric emptying rate is preferable for sports drinks, as this increases the rate of absorption.

GENERAL ADAPTATION SYNDROME (GAS): Developed by Hans Selye, GAS describes the body's physiological response to stress. It consists of three phases: Alarm, Resistance, and Exhaustion. Applying GAS to physical training, it demonstrates that the body can get stronger by adapting to stress, but if the stress applied is too intense the body will begin to break down.

GLUCONEOGENESIS: The process of creating glucose from non-carbohydrate sources, such as glycerol, lactate, or amino acids.

GLUCOSE: Blood glucose, or blood sugar, is the main type of sugar found in the blood. Glucose is the primary source of energy for the body's cells.

GLYCAEMIC INDEX (GI): A scale that ranks carbohydrate-containing foods from 0-100 based on how slowly or quickly they are digested and cause an increase in blood glucose levels. Pure glucose has the highest glycaemic index at 100, as its consumption raises blood sugar levels very quickly.

GLYCOGEN: The main form of carbohydrate storage in the body. Glycogen is primarily stored in the liver and muscles and can be converted to glucose for energy.

GLYCOGEN DEPLETION: Lack of glycogen in the body results in a loss of energy and extreme fatigue. When energy stores are depleted, the body's cells and muscle tissue are damaged and the immune system is stressed. Often referred to as a "bonking", or "hitting the wall".

GLYCOLYSIS: The anaerobic metabolic process that breaks down glucose into pyruvate and ATP. If the aerobic capacity of the muscle is sufficient, the pyruvate produced can enter the mitochondria and undergo further aerobic metabolism. However, if the aerobic capacity of the muscle is insufficient, the production of pyruvate can also be a metabolic dead-end. In this case, the metabolite lactate accumulates, with negative consequences for endurance. Glycolysis is the primary energy supply for ATP synthesis in high-intensity exercise because glycolysis proceeds at a faster rate than the breakdown of fats.

GOLGI TENDON ORGAN (GTO): The GTO is a sensory nerve receptor located at the junction of a muscle and its tendon. During a stretch, the GTO senses muscle tension and sends a signal to the spinal cord. If the tension is deemed excessive, the spinal cord sends a signal back to the muscle to relax. This is called the Golgi Tendon Reflex. The GTO acts as a safety mechanism to regulate muscle contraction and protect against excessive force generation.

GRADUALNESS: Adaptation to a training stimulus takes time and occurs in small increments. Rapid increases in training load cannot be accommodated long-term. A successful training plan *gradually* progresses the training load over weeks and months in a systematic way, avoiding large and unmanageable jumps.

HAEMOGLOBIN: Abbreviated Hb or Hgb, haemoglobin is an iron-rich protein found in red blood cells that carries oxygen throughout the body.

HEART RATE MAX (HRMAX): The highest heart rate achieved during an all-out effort. An athlete's heart rate during the final 30 seconds of an all-out race is a good estimate of HRmax. Also known as peak heart rate.

HEART RATE MONITOR (HRM): Typically worn as a chest-strap or armband, a heart rate monitor reads an athlete's heart rate in real time. Wrist-based heart rate readings recorded on a watch should be ignored due to inaccuracy.

HEART RATE RECOVERY: Assesses how fast the heart rate drops in a set duration of time after an intense effort. As an athlete becomes more aerobically conditioned, the faster the heart rate will recover.

HEART RATE RESERVE (HRR): The difference between an athlete's maximum heart rate and resting heart rate. Heart rate reserve is a measure of the heart's capacity to increase its rate during physical activity. HRR is often used to determine exercise intensity levels (prescribed as %HRR).

HEAT STROKE: An elevated core body temperature of 41°C (or greater), caused by exposure to excessive heat or high levels of heat production and diminished heat loss. Can result in tissue damage and is potentially fatal.

HEAT SYNCOPE: A brief fainting spell or feeling of dizziness caused by excessive heat exposure. Heat stimulates blood vessels to dilate, causing body fluids to move into the legs, which results in reduced blood pressure that can cause fainting. Heat syncope is a type of heat illness also known as orthostatic dizziness.

HEMATOCRIT: The percentage of red blood cells in the blood. Normal levels of hematocrit range from 41% to 50% for men, and 36% to 48% for women.

HOMEOSTASIS: A stable state of equilibrium in an organism. Physical training disrupts homeostasis, resulting in adaptations that allow the body to handle similar training loads more effectively in the future.

HYPERTROPHY: An increase in muscle mass, usually manifested as an increase in muscle size and strength. Opposite of atrophy.

HYPERNATREMIA: An electrolyte imbalance which results in there being too much sodium in the blood. Hypernatremia is defined as a rise in serum sodium concentration to above 145 mmol/L. Often caused by extreme dehydration. Opposite of hyponatremia.

HYPERTHERMIA: Also known as heat-related illness, hyperthermia occurs when the body's heat-regulation system becomes overwhelmed by outside factors, causing the body's core temperature to rise over 37°C. Can lead to fatality in extreme cases. Opposite of hypothermia.

HYPONATREMIA: An electrolyte imbalance which results in there being too little sodium in the blood. Hyponatremia is defined as a drop in serum sodium concentration to below 135 mmol/L. Often caused by extreme over-hydration. Opposite of hypernatremia.

HYPOTHERMIA: A condition that occurs when core body temperature drops below what is required for normal bodily function (below 35°C). Can lead to fatality in extreme cases. Opposite of hyperthermia.

HYPOXIC: In regard to physical training, this refers to an environment that has reduced oxygen levels. This can be a naturally hypoxic environment (such as training at altitude) or an artificially hypoxic environment (such as an altitude chamber). The purpose of hypoxic training is to increase the number of red blood cells in the body.

INDIVIDUALITY: The need to account for an individual athlete's genetics, training history, goals, lifestyle, and other individual factors when designing a training plan.

ILIOTIBIAL (IT) BAND SYNDROME: A condition where the iliotibial band, a thick band of tissue running down the outside of the leg from the hip to the shin, becomes irritated and inflamed, typically causing pain on the lateral aspect of the knee. The primary cause is compression of highly innervated fat beneath the IT band. Often referred to as "runner's knee".

INNERVATE: The process of stimulating muscles with nerves, which causes them to contract and relax.

INSULIN: A hormone secreted by the pancreas that regulates carbohydrate and fat metabolism in the body. Insulin causes cells in the liver, skeletal muscles, and fat tissue to absorb glucose from the blood. In the liver and skeletal muscles, glucose is stored as glycogen, and in fat cells, it is stored as triglycerides.

INTENSITY: Intensity is a measure of the rate of energy consumed by the body. Intensity determines the preferential fuel the muscles use. It also determines the kind of adaptations that will be caused by the training. Common measures of intensity include heart rate, pace, rate of perceived exertion (RPE), blood lactate levels, and percentage of VO2 max.

INTERVAL: A rest (or recovery) interval is the break between repetitions during high-intensity training. The 60 second recovery period between repetitions in a 10 x 400m workout is the interval. Recovery intervals can involve static rest, jogging, or moderate intensity running (e.g. float intervals).

INTERVAL TRAINING: An endurance training method whereby bouts of higher intensity exercise are separated by rest (or recovery) intervals. This allows the athlete to handle a higher volume of high-intensity training with less fatigue than when performing a continuous high-intensity effort of the same duration.

INVERSION: A type of foot movement that involves turning the ankle and foot inward, toward the midline

of the body. Opposite of eversion.

INVOLUNTARY MUSCLE CONTRACTION: A type of muscle contraction controlled by the autonomic nervous system (ANS) that occurs without conscious thought. For example, contraction of the heart.

ISOKINETIC: A type of muscle contraction in which the shortening/lengthening of the muscle occurs at a set speed. The speed of the muscle shortening/lengthening is usually controlled by an outside source, such as a dynamometer.

ISOMETRIC: A type of muscle contraction that occurs when a muscle generates tension without changing length. Isometric contractions are characterised by a lack of movement and are also known as static contractions. A plank is an example of an isometric contraction.

ISOTONIC: A type of muscle contraction that occurs when a muscle changes length while maintaining a constant level of tension. A bicep curl is an example of an isotonic contraction.

KINETIC LINKING: Relates to the order in which muscles activate and work together to allow the body to move. From a performance standpoint, more efficient kinetic linking can be developed to give an athlete a biomechanical advantage. Also known as the kinetic chain.

KREBS CYCLE: Part of the aerobic metabolic process that takes place within a cell's mitochondria. The Krebs cycle involves an eight-step sequence of reactions, during which acetyl-CoA is oxidised to produce ATP. The Krebs cycle is present in every cell that uses oxygen to produce energy. Also known as the citric acid cycle.

LACTATE: The metabolic end product of anaerobic glycolysis is lactic acid. Once produced, lactic acid is immediately dissociated into lactate and a hydrogen ion (H^+). Lactate then has two available pathways where it can be used as fuel: 1) It can be converted to pyruvate, which can then enter the Krebs cycle (aerobic metabolism); 2) It can be converted to glucose in the liver via the Cori cycle (anaerobic metabolism). The release of the hydrogen ions during lactic acid dissociation can lower the blood's pH (increase its acidity). If this continues without adequate buffering, the additional H^+ in the blood can produce a burning sensation in the muscles (often incorrectly associated with lactic acid build-up) and a forced slowing of the pace.

LACTATE BALANCE POINT: The point where lactate production is equal to lactate removal. This is considered the point of maximal intensity that can be maintained for a long duration without a subsequent rise in blood lactate level. This metabolic point has a direct relation to the time to exhaustion at VO_2 max intensity and, as such, bears strongly on the endurance of an athlete. It depends largely on the ability of the active muscles to oxidise lactate. Hence, the aerobic capacity of the slow-twitch muscle fibres, along with the lactate shuttle process, is largely responsible for endurance at high-intensity levels of exercise. Also frequently referred to as Lactate Threshold (LT), LT_2 (Second Threshold), and Maximal Lactate Steady State (MLSS).

LACTATE SHUTTLE: The mechanism by which lactate is moved out of the working muscles where it is being produced and into slow-twitch muscle cells where it can be used as fuel to produce ATP via aerobic metabolism. This mechanism explains the importance of the aerobic base in supporting high-intensity training. The greater the aerobic capacity of the slow-twitch fibres to take up and utilise lactate, the longer high-intensity workloads can be sustained.

LACTATE THRESHOLD (LT): The lowest intensity of exercise at which the rate of lactate production increases faster than the rate of lactate removal. LT typically occurs at blood lactate concentrations of about 4mmol/L. Above this intensity, lactate levels in the blood begin to rise. The greater the intensity above LT, the greater the rise in blood lactate. See Anaerobic Threshold (AnT).

LACTIC ACID: The metabolic end product of anaerobic glycolysis. Lactic acid is immediately dissociated into lactate and a hydrogen ion (H^+). See Lactate.

LATERAL: Movement away from the midline of the body. Opposite of medial.

LIGAMENT: Fibrous tissue that connects bone to bone.

LOAD (WEIGHT): The amount of resistance used during strength training. During the transition period (off-season), athletes should use a load 50-75% of their one-rep max. During the max strength period, they should use a load 85-90% of their one-rep max, or enough to allow only five reps to be completed.

LOCAL MUSCULAR ENDURANCE: The concept of training relatively small muscle groups for endurance without imposing a large load on the cardiovascular system. This effect is accomplished by ensuring the muscular load is high, through added resistance. This causes the aerobic capabilities of the high-power muscle fibres (which are responsible for the movement) to be the limit on exercise, not the cardiovascular system's ability to supply oxygen to those muscles. The fatigue from this sort of training will be localised to that small group of muscles alone.

LOW ENERGY AVAILABILITY (LEA): A condition that occurs when the body doesn't have enough energy to meet its needs and runs at an energy deficit. If this deficit is severe and lasts long enough, it can lead to Relative Energy Deficiency in Sport (RED-S). Frequently prevalent LEA in athletes is defined as <30 kcal/kg FFM/day.

LT1 (FIRST THRESHOLD): The lowest intensity of exercise at which blood lactate levels increase above resting levels (about 2mmol/L). See Aerobic Threshold (AeT).

LT2 (SECOND THRESHOLD): The lowest intensity of exercise at which the rate of lactate production increases faster than the rate of lactate removal. Typically occurs at blood lactate concentrations of about 4mmol/L. See Anaerobic Threshold (AnT).

MACROCYCLE: A period representing one complete cycle of training. In competition, this period will usually coincide with an annual cycle of training, hard competition, and the regeneration/recovery necessary before embarking on another annual cycle.

MAXIMAL LACTATE STEADY STATE (MLSS): The highest blood lactate concentration (MLSSc) and workload (MLSSw) that can be maintained over time without a build-up of blood lactate. See Lactate Balance Point.

MEDIAL: Movement toward the midline of the body. Opposite of lateral.

MENTAL IMAGERY: See Visualisation.

MESOCYCLE: A training block that lasts a few weeks or months and focuses on developing a specific physiological quality, such as VO2max, lactate threshold, muscular strength, or aerobic endurance.

METABOLISM: The chemical processes that occur in the body to create energy and materials for growth and repair. In exercise performance, metabolism refers to the energy production necessary to yield ATP molecules and produce muscular work.

MICROCYCLE: A period of training that is repeated several times during a mesocycle. Typically one week in length.

MITOCHONDRIA: Tiny organelles within all animal cells responsible for the majority of ATP production (via oxidative phosphorylation). The number and functionality of mitochondria positively correlates with exercise capacity. Due to their crucial role in cellular energy production, mitochondria are often called the powerhouse of the cell. In exercise performance, we are mostly interested in the mitochondria in the muscle cells, which undergo adaptation as a result of training stimulus.

MODULATION: The variation in training load. Can indicate changes in both day-to-day and week-to-week training loads, from light to heavy.

MOTOR UNIT: A fundamental unit of muscle that consist of a motor neuron and all the muscle fibres it innervates.

MUSCLE CRAMP (EXERCISE-RELATED): Characterised by a muscle involuntarily contracting. Muscle cramps are often painful due to the intensity and duration of the contraction. Cramping can be caused by glycogen depletion, dehydration, low levels of potassium, or exercising for a longer period of time or at a higher intensity than the body is conditioned for.

MUSCLE FIBRE: A single muscle cell that contracts to create movement. Muscle fibres are found in skeletal, smooth, and cardiac muscle tissue. The two main types of skeletal muscle fibre are slow-twitch and fast-twitch muscle fibres.

MUSCLE FIBRE CONVERSION: Muscle fibres respond directly to the training stimulus imposed upon them. Chronic training of a particular type over many months has the effect of changing the muscle fibre's characteristics. Multi-year studies indicate that prolonged endurance training will result in improved endurance of the faster-twitch fibres within an endurance-trained muscle.

MUSCLE PROTEIN SYNTHESIS: The body's

process of building new muscle tissue by incorporating amino acids from protein into muscle proteins. Crucial for recovery, adaptation to training, and muscle growth.

MUSCLE SPINDLE: Muscle spindles are located deep in a muscle's belly. Muscle spindles sense changes in muscle length. When a muscle is overstretched, muscle spindles send a signal to the spine which triggers the stretch reflex (also called the myotatic reflex). The stretch reflex looks to resist the increase in muscle length by causing the muscle to contract. The more rapid the increase in muscle length is, the stronger the stretch reflex is. Therefore, the primary function of muscle spindles is to protect the body from injury due to over-stretching.

MUSCLE STRAIN: Injury to a muscle or tendon. Commonly occurs when a muscle is stretched too much and part of it tears. Also known as a pulled muscle.

MUSCULAR COMPENSATION: Occurs when a muscle is unable to provide some or all of the required muscle activation. This leads to other muscles being activated to assist in performing a particular movement.

MYOFASCIAL RELEASE: A therapy technique often used in massage that aims to release tightness and restrictiveness of the muscles and fascia.

MYOFIBRIL: Contractile fibres that run along the length of a muscle cell. Composed of myosin and actin. Myofibrils are the machinery that drives contraction and relaxation of the muscle.

MYOSTATIN: A hormone produced by muscle cells that inhibits muscle growth and differentiation, leading to reduced muscle mass.

NON-EXERCISE ACTIVITY THERMOGENESIS (NEAT): The energy expended during everyday physical activity that is not sleeping, eating or structured exercise.

ONE-REP MAX: The maximum load an athlete can lift for one repetition of an exercise movement.

ONSET OF BLOOD LACTATE ACCUMULATION (OBLA): The point at which lactate begins to accumulate in the blood at an accelerated rate (typically when blood lactate levels reach 4 mmol/L). Also frequently referred to as Lactate Threshold (LT), LT2 (Second Threshold), and Lactate Balance Point.

OVERPRONATION: When the foot rolls inward too much while walking or running. Although there is not a clear consensus on exactly how many degrees equates to overpronation, many clinicians believe that a subtalar joint angle greater than 8- 10 degrees is considered overpronation.

OVERREACHING: A training method used to temporarily apply an excessive training load to an athlete. Can be as short as one to two days or up to a week-long training camp. Needs to be done in a controlled manner when the athlete has minimal life stress. Overreaching must be followed by a significant recovery period.

OVERTRAINING: A condition common in endurance athletes where training bouts are no longer followed by supercompensation. No matter the length of the recovery window the athlete's performance degrades. This is a serious condition that needs dramatic intervention.

OXIDATIVE PHOSPHORYLATION: A cellular process that takes place in the mitochondria and generates ATP through phosphorylation of ADP. Oxidative phosphorylation is the last phase of the aerobic metabolic pathway and is responsible for the

majority of ATP generation.

OXYGEN DEBT: The difference between oxygen consumption at rest and the elevated rate of oxygen consumption following exercise. The oxygen intake that continues after exercise seeks to eliminate oxygen debt and is known as excess post-exercise oxygen consumption (EPOC).

PARASYMPATHETIC NERVOUS SYSTEM: The part of the autonomic (*involuntary*) nervous system that serves to slow the heart rate, increase intestinal and glandular activity, and relax the sphincter muscles. Also known as the "rest and digest" system.

PATELLOFEMORAL PAIN SYNDROME (PFPS): Pain at the front of the knee, around the kneecap. There are many potential causes of PFPS, including muscle imbalances of the quadriceps, asymmetrical hip rotation, and compressive forces. Often referred to as "runner's knee".

PEAKING: A systematic process by which an individual reaches their highest possible physical level of preparedness on a set date or time frame.

PERIODISATION: The deliberate manipulation of training variables to optimise performance for competition, prevent overtraining, and progress performance. Variable adjustments in duration, load, or volume are planned out over a specific period of time to achieve these objectives. Periodisation also allows the athlete to focus time and energy on developing one or a few desired training adaptations at a time.

PERIODISATION CYCLE: A cyclical method of structuring and planning training reach, with the aim of reaching peak performance on a set date or time frame. Periodisation cycles include macrocyles, mesocycles, and microcycles. The macrocycle represents the annual plan. The mesocycle represents a training block that lasts a few weeks or months. The microcycle typically represents a week of training.

PH: A measure of the acidity or alkalinity of a solution on a logarithmic scale. A pH of 7 is neutral. Lower values are more acidic and higher values are more alkaline.

PICK-UPS: Pick-ups are similar to strides, but are shorter in duration and are performed spontaneously throughout a run, without complete recovery between repetitions. When the feeling and terrain motivates you, pick-up the pace to a fun, fast effort (not quite an all-out sprint) and run easy to recover between reps.

PLANTAR FASCIITIS: The plantar fascia is a fibrous band of tissue that runs from the heel to the forefoot. Plantar fasciitis occurs when the plantar fascia is inflamed and often presents with heel or arch pain.

PLANTAR FLEXION: Movement that increases the angle between lower leg and foot. Wearing high-heeled shoes puts the foot in a constant state of plantar flexion. Opposite of dorsiflexion.

PLASMA: The liquid portion of the blood in which the blood cells are suspended. Typically accounts for 55-60% of total blood volume.

PLATELET-RICH PLASMA (PRP) INJECTION: A mixture of blood plasma and a high concentration of platelets (made from the patient's own blood) that can be injected into an injured area of the body to treat osteoarthritis and injuries to tendons, ligaments, and muscles.

PLYOMETRICS: A power building exercise technique that is characterised by explosive, jumping movements.

POLARISED TRAINING: A term used to indicate a training intensity distribution where training volume is dominated by low intensity (80 percent) and high intensity (20 percent) workloads, with relatively little moderate intensity. Used predominately by elite endurance athletes.

POSTERIOR: Anatomical directional term referring to the back (or toward the back) of the body. Opposite of anterior.

POWER: The rate at which work is done. The equation for power is work divided by the time to complete the work (P = W/T). Power is often confused with energy or work. The crucial differentiating element of power from work or energy is the measure of time in the denominator.

PRIME MOVER: Muscle (or muscles) that are *primarily* responsible for movement around a joint (for example, the quadriceps are agonists that extend the leg). Also known as an agonist.

PROGRESSIVE OVERLOAD: A training principle which states that a greater than normal stress on the body needs to be present for a training adaptation to occur.

PROGRESSIVE STRIDES: See strides. During progressive strides, each successive stride is conducted at a progressively higher intensity. So the first 1 or 2 reps might be performed at 70% maximum effort, the next 1 or 2 reps might be performed at 80% maximum effort, and the final 1 or 2 reps might be performed at 90% maximum effort.

PRONATION: Medial rotation of a body part. Opposite of supination.

PRONE: Anatomical position in which the front surface is facing downward. Lying face-down is an example of the body in a prone position.

PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF): A PNF stretch consists of a passive stretch followed by an isometric (static) muscle contraction. During PNF stretching, a muscle is repeatedly contracted and relaxed, which triggers the golgi tendon reflex numerous times.

PROTEIN: A molecule composed of one or more chains of amino acids. Protein is necessary for the structure, function, and regulation of the body's cells,

tissues, and organs.

PROTEIN SYNTHESIS: The biological process by which cells create proteins using amino acids as building blocks. See Muscle Protein Synthesis.

PROXIMAL: Anatomical directional term referring to structures closer to the point of attachment and closer to the centre of the body (for example, the elbow is proximal to the hand). Opposite of distal.

PYRUVATE: An end product of glycolytic metabolism that can take one of two metabolic paths: 1) Entering the mitochondria and undergoing aerobic metabolism (if there is sufficient aerobic capacity in the muscle cell); or 2) Accumulating in the cytosol of the cell and being converted to lactate.

RATE OF PERCEIVED EXERTION (RPE): A subjective rating, on a numerical scale (typically 1-10), used to express the perceived difficulty of a given exercise task.

REACTIVE HYPOGLYCAEMIA: A condition that results in episodes of low blood glucose (<3.5 mmol/l) during exercise when carbohydrate is consumed in pre-workout meals. Eating carbohydrate (especially high glycaemic index carbohydrate) in the hour before exercise raises blood glucose and insulin concentrations, resulting in an increased uptake of glucose by the tissues. When exercise is initiated, glucose uptake by the muscle will further increase without an increase in hepatic glucose output, resulting in a decrease in blood glucose concentration. Symptoms of reactive hypoglycaemia include shakiness, dizziness, sweating, nausea, headache, blurred vision, and confusion. Also known as rebound hypoglycaemia.

REDUCED MUSCLE ACTIVATION: Occurs when a muscle is overly tight. This causes the nervous system impulses to the overly tight muscle to decrease, which can affect the ability of the opposing (antagonist) muscle to contract properly.

RELATIVE ENERGY DEFICIENCY IN SPORT (RED-S): A condition that occurs when, knowingly or unknowingly, an athlete's energy *intake* doesn't meet their energy *expenditure*. RED-S compromises training adaptation, performance capacity, and health. In extreme cases, RED-S can result in the body not having enough energy to fulfil normal physiological functions. It can affect athletes of any gender or ability.

REPETITION OR REP: One complete exercise movement cycle. One 400m circuit of the track during a 10 x 400m workout would be one rep. One pull-up movement during a strength training session would be one rep.

REPS IN RESERVE (RIR): A training method that estimates how many more repetitions you could perform before reaching failure. For example, if your training plan recommends finishing with 1-2 reps in reserve, this means you should aim to finish your workout *before* you reach complete exhaustion, at the point where *if* you were to complete 1-2 more reps it would result in failure.

RESPIRATORY EXCHANGE RATIO (RER): The ratio of carbon dioxide produced divided by oxygen consumption, representing a measure of substrate utilisation at the whole body level. An RER of 0.7 indicates that the body is primarily using fat. An RER of 0.85 indicates that the body is using a mix of fat and carbohydrates. An RER of 1.0 indicates that the body is primarily using carbohydrates.

RESTING HEART RATE (RHR): Represents the heart rate at rest (before getting out of bed in the morning). This can be used as both a fitness and a recovery assessment tool.

RESTING METABOLIC RATE (RMR): See Basal Metabolic Rate (BMR).

RETRACTION: Moves backward (posteriorly). Squeezing the shoulder blades together results in retraction of the shoulder blades.

ROTATION: Circular motion around a fixed point. Turning the torso in the transverse plane while in an upright, standing position is an example of rotation.

SAGITTAL PLANE: Divides the body into right and left halves. Walking in a straight line (forward or backwards) represents movement in the sagittal plane.

SARCOMERE: The smallest contractile unit or segment of a muscle fibre. Defined as the region between two Z lines.

SAUNA PROTOCOL: Use of a dry sauna for the purpose of heat acclimation.

SECONDARY MOVER: A muscle or muscle group that contributes indirectly to produce movement. A secondary mover supports the primary mover. For example, during a push-up, the pectoralis major is the primary mover and the tricep is a secondary mover.

'SEE GOD' WORKOUT: A workout during which an athlete pushes to their absolute limit and 'sees God'. These sessions should be performed sparingly, if at all (once or twice a year, maximum). 'See God' workouts are intended to shift an athlete's perspective and when timed correctly, can result in a large supercompensation effect.

SET: A group of repetitions. One set can contain anywhere from a single rep to many reps (e.g. a 10 x 400m workout).

SHIN SPLINT: A relatively generic term used to describe pain in the region of the tibia. Shin splints can be categorised into three main areas: muscular, tibial fascia, and skeletal.

SKELETAL MUSCLE: All muscles that are not cardiac or smooth. These are the muscles that provide movement of the body and account for 35-45% of overall bodyweight. There are approximately 640 skeletal muscles in the body, most of which are grouped in pairs.

SLIDING FILAMENT MODEL: This model states that within the sarcomere, actin and myosin are alternately layered on top of one another. The myosin ratchets along the actin and causes the actin to shorten. This compression in turn causes the sarcomere to shorten. Each sarcomere is connected to the next sarcomere by what is called a "Z line". When a muscle contracts, all of the sarcomeres contract at the same time. This simultaneous contraction produces force at each end of the muscle fibre.

SLOW-TWITCH (ST) MUSCLE FIBRE: Often referred to as Type I fibres, slow-twitch muscle fibres have greater endurance than fast-twitch muscle fibres. They have more mitochondrial density, denser capillarisation, and higher levels of aerobic enzymes. They are smaller in cross section and contract with less force than fast-twitch fibres. They have a higher concentration of myoglobin, so appear more red than fast-twitch fibres.

SMOOTH MUSCLE: Involuntary muscles that surround organs for the purpose of protection against outside forces.

SPECIFICITY: Training that mimics the demands of the sport.

SPORT-SPECIFIC STRENGTH: Training that imposes muscular loads in a sport-specific manner.

SPRAIN: Injury to a ligament (ligaments connect bone to bone). Sprains are categorised from Level 1-3, with 3 being the most severe.

STATIC STRETCH: Stretching where a body part is held in a stretched, non-moving position. For example, bringing the heel towards the buttock and holding it there is a static quadriceps stretch. Opposite of dynamic stretch.

STRENGTH: The ability of a person to product a force on an object using the musculoskeletal system.

STRENGTH-ENDURANCE CONTINUUM: States that strength and endurance are inversely related. Low numbers of repetitions with relatively high loads are associated with increases in strength, whereas high numbers of repetitions with low loads are associated with increases in endurance. According to the concept, as repetitions increase there is a gradual transition from strength to endurance.

STRENGTH TRAINING: Any type of exercise that puts stress on a muscle or muscles for the purpose of strength gains. Typically associated with callisthenics or lifting weights.

STRIDE RATE: See Cadence.

STRIDES: Strides are 15-30 second bursts of speed, performed with long-distance running form at around 90% of maximum effort (not quite an all-out sprint). Strides are performed to improve neuromuscular efficiency (running economy) and to warm-up the legs prior to a hard workout or race.

STROKE VOLUME: The volume of blood that is pumped from the heart (specifically, the left ventricle) in one beat. This is a highly trainable quality. Endurance training leads to an increase in stroke volume up to a point that is most likely determined by an athlete's genetics.

STRUCTURAL ADAPTATION: The changes to the body's structures that occur in response to chronic training loads. An example of a structural adaptation is hypertrophy of the left ventricle of the heart. A more muscular left ventricle allows the heart to pump more oxygenated blood to the working muscles with each heartbeat.

SUPERCOMPENSATION: The post-training period during which the parameter that was trained rises to a higher performance capacity than it had before the training.

SUPERFICIAL: Anatomical directional term used to describe a structure that is closer to the surface of the body than another structure (for example, skin is superficial to bone). Opposite of deep.

SUPINATION: Rotation of the forearm or foot so that the palm or sole faces upward (or anteriorly). Opposite of pronation.

SUPINE: Anatomical position in which the front surface is facing upwards. Lying on the back is an example of the body being in a supine position.

SYMPATHETIC NERVOUS SYSTEM: The part of the autonomic (*involuntary*) nervous system that serves to accelerate the heart rate, constrict blood vessels, and raise blood pressure. Associated with the "fight-or-flight" response.

TAPER: A reduction in training load and intensity, typically performed after a training build-up to allow the body to reach a higher level of performance. Often completed prior to an important event.

TEMPO: Generally speaking, a tempo run is a sustained, comfortably hard effort that develops the body's ability to run faster for longer periods of time. However, *tempo* alone is not a prescribed intensity. Tempo sessions can be conducted at various effort levels, such as 5k tempo, 10k tempo, half marathon tempo, or marathon tempo.

TENDINOSIS: Damage to the structural integrity of a tendon. Often termed tendinitis.

TENDON: Fibrous tissue that connects bone to muscle.

THERMOGENESIS: The production of heat in organisms. All metabolic processes in the body generate heat constantly. During exercise, the body converts chemical energy (from food) into mechanical energy (movement) with a relatively low efficiency, typically around 20%. This means that for every unit of energy the body uses, only about 20% is used for movement, while the remaining 80% is released as heat, which the body then needs to dissipate to maintain a stable core temperature. Heat is therefore the greatest waste product of exercise.

TRAINING EFFECT: Indicates, in a qualitative way, how an athlete's body responds and adapts to various forms of training stimuli.

TRAINING LOAD: A term used to describe the type and amount of stress imposed by a single workout or period of training: the Training Load causes the Training Effect. They both depend on the type, intensity, and volume of work performed in a training bout.

TRAINING STIMULUS: A bout of exercise designed and executed so as to encourage certain training adaptations to occur.

TRANSVERSE PLANE: Divides the body into top and bottom halves. The most common movement in the transverse plane is rotation. Rotating the upper body to one side is an example of movement in the transverse plane.

TRIGLYCERIDES: Compounds that contain glycerol and free fatty acids. Glycerol and free fatty acids are the elements that the body breaks down for energy. Glycerol is broken down anaerobically through glycolysis, whereas fatty acids are broken down through a process called beta-oxidation. During beta-oxidation, fatty acid is converted into Acetyl CoA and

then enters the Krebs Cycle to be oxidised.

UNILATERAL: Movement by one side of the body. For example a dumbbell curl, where one arm is lifted at a time and one bicep produces the force to lift the weight. Opposite of bilateral.

UTILISATION TRAINING: Training that improves the *near-term* performance results of the athlete. Utilisation training is commonly prioritised during the build-up to the competition period or the target event. This training models the specific demands of the event an athlete is training for.

VALGUS: Inward angle of bone or joint (for example, knock knees). Opposite of varus.

VARUS: Outward angle of bone or joint (for example, bow legged). Opposite of valgus.

VEINS: Blood vessels that carry de-oxygenated blood from the body to the heart.

VENTILATORY THRESHOLD (VT): The point at which the ventilation rate increases faster than the workload. Until the ventilation threshold is reached, the workload and respiration rate increase linearly. A notable shift in breathing depth and rate that indicates a change in cellular respiration (and hence metabolism) occurs at the VT. Useful as a real-time indication of the intensity of exercise. Exercise science recognises two ventilatory thresholds: VT1, which corresponds to the Aerobic Threshold, and VT2, which corresponds to the Anaerobic (or Lactate) Threshold.

VISUALISATION: A psychological technique used by athletes to enhance performance. Visualisation involves imagining oneself performing a skill successfully. Visualisation can help athletes control emotions and reduce anxiety before a competition. External imagery occurs when an individual "sees" themselves performing an activity. Internal imagery occurs when an individual "feels" how they might anticipate feeling during the event itself. Also known as mental imagery or mental rehearsal.

VK (VERTICAL KILOMETRE): A race involving an elevation gain of one vertical kilometre on steep terrain.

VO2: The rate of oxygen uptake.

VO2MAX: The measure of the maximal aerobic power an athlete can develop. Measured by comparing the rate of inspired and expired oxygen during a multi-step exercise test to voluntary exhaustion. Often referred to as an individual's maximal oxygen consumption or as the test that assess one's aerobic capacity. The V stands for ventilation and O2 for oxygen. One's VO2max refers to the amount of oxygen an individual can utilise in one minute and is expressed in ml/kg/min. This means millilitres of oxygen per kilogram of bodyweight per minute.

VOLUNTARY MUSCLE CONTRACTION: A type of muscle contraction controlled by the central nervous system (CNS) that occurs with conscious thought. For example, a bicep curl.

WORK: Work equals force multiplied by the distance over which the force is applied. For example, a 20kg weight lifted 3m has had 60 Joules of work done to it.