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Role of Physique and Nutrition in the Performance of Sports

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Abstract

In present day sports, performance demands are continually increasing. It is crucial to note here that sports performance of athletes is highly regulated by their age, stature, weight and body structure. Body composition and body physique play crucial role in sports and activities by directly influencing the biomechanics of movement and performance. It is obvious to have differences in body size, body proportion, height and weight among different people.

Keywords: physique, performance, morphology, maturation and athletic health

1. Introduction

It could be elucidated that an individual's morphological profile provides a baseline to plan and monitor their performance.

Somatotyping is essentially important here for examining developmental dynamics of specific shape and size of human body, in accordance with the function of skill and training, for both competitive and leisure time-phases. It also helps to decide whether a performer would be suitable to participate in the particular type of sport / activity with their body profile. It is then that the person with particular body type best suited for an activity / sport could be motivated to follow / take part in that pursuit. It is significant to note here that functional / technical / training, physiological / tactical, biochemical and motor capabilities along with environmental factors and genetic endorsements are equally instrumental as much as somatic characteristics. All these aspects behave differently among different performers giving up variety in body composition and structure that becomes ideal for addressing varying demand for specific body physique, size and proportion in diverse sports and activity arenas.

Kinanthropometry, not a widely circulated term, deals with current status or phenotype of body of an individual. It focuses on measurement of personnel for morphological perspectives like components of body build and maturation; body measurements, proportions, composition, shape; motor abilities; cardio respiratory capacities; and their application during movement for physical activity, recreational or of specialized sports kind. It acts as a dynamic interface between assessment of structure / anatomy and function / movement in / of human. It is used as a performance prediction tool rather than just of a diagnostic

nature for selection process but also giving hold for tracking and recognizing the highest success rate. Study of body physique and morphology is indispensable so as to decide upon the ideal standards for championing the respective events at activities and sports. So, kinanthropometry aids at estimating body size differences, somatotyping and body composition.

Body physique that refers to the shape and size of the body of being has a critical role to play in attaining better performance. Human physique differs according to the requirement for a specific sport or activity, or an unsuitable body may rather become a barrier in enhancing performance. As for example, specific athletic demands for a different body type, body composition along with an exact range of height and weight for maximum performance. Human physique is under constant influence of fat mass and fat-free mass ratio, apart from environmental and genetic factors. Classification of body physique termed as somatotyping put forth by various scholars and researchers like Hippocrates, Kretschmer, Viola, Sheldon, Parnell to the much recent and widely accepted one proposed by Heath and Carter have helped comprehending the concept and its role much better in day-to-day activities. Somatotyping makes use of adiposity, musculo-skeletal robustness and linearity outlook of a physique rather than for just considering simple linear anthropometric measurements. It is one of the best biological identification tags of an individual. Somatotype of an individual is presented as a combined rating of each of these components, where one of the components being dominant is described to be as the somatotype of the person in terms of that particular component.

2. Body Physique

Body physique refers to the shape and size of body. Human physique differs in many ways, whereby various human physiques play important role in attaining better performance in particular sports. Every sport demands a specific type of body physique whereas an unsuitable body type in sports may become a great barrier in the progress of sports performance. Realizing the importance of different physiques, during ancient times great Greek Philosopher, Hippocrates during 5th century B.C. for the first time introduced the method of body classification under which the individuals were divided into two body types as "habitus phthisis", one who has a thin and lean body with long extremities, and the other "habitus apoplecticus", having short, thick and massive body.

Much later, at the beginning of 12th century, one of the earliest researchers in this field, a German psychiatrist named Kretschmer classified human physique into three categories as asthenic or thin type; athletic or muscular type; and the final as pyknic or fatty type. Further, Viola, an Italian researcher, also in the12th century developed a method to categorise humans into four types as Longitype, with long limbs; Brachitype, with broad limbs, Normotype, having limbs within normal range and the Mixetype, with mixed characteristics. Sheldon and his associates, in 1940, devised a method to analyse and quantify human body type to which they referred it to as somatotyping, for which they used photoscopic way to identify different physiques. This technique used a 7-scale method for categorising the body physique as Endomorphs, those more with fatty content in them; Mesomorphs, more with muscle content in them; and Ectomorphs, as those who lack both muscle and fat content in them.

Later in 1967, Heath and Carter modified this method of Sheldon's into a more objective method of somatotyping employing anthropometric measurements. According to them "a somatotype is a description of the present morphological conformation. It is expressed in a numeral rating consisting of three sequential numerals always recorded in the same manner. Each numeral represents the evaluation of the three primary components of physique which describe individual variations in human morphology and composition". As a means for assessing body shape and composition, independent of size, somatotyping is applied to the description of groups of outstanding athletes. Somatotyping began to be practiced among the Olympic athletes in 1951 by Cureton. Somatotype studies were done by Tanner (1964) at the Rome Olympics, Garay et al. (1974) carried out the largest study on the athletes at the Mexico Olympics and Carter et al. studied athletes at the 1976 Montreal Olympics.

3. Body Composition

Constitutional make-up of body i.e., body composition is another important ingredient for enhancing sport / activity accomplishments. Physical performance components / physical

fitness abilities like speed, strength, agility and coordination are also interwoven in the development of body structure. Skill, psychological features, powerful and capacious energy production systems are important factors in sports performance, but body size, shape, proportion, composition and morphology are the major success related factors in sports. Distribution of body weight as a function of different components could be determined in terms of the major constituents of body as fat mass, muscle mass and bone mass. Body composition of athletes is an important tool for evaluating their health, for monitoring the effects of training program and to decide upon the optimal competitive body weight and other components of body composition. Understanding the effects of training on body composition can help athletes in controlling weight and adjust their body composition safely. Seasonal variations in body composition can also be studied and used to find the optimal body composition levels for health, recovery, training and competition. Following body composition trends in specific sports enable coaches to accurately prepare the athletes for specific events or positions. Due to the great significance of body composition in athletic health and performance, it is crucial to ensure a safe, practical and efficient method of computing body composition.

Body fat percentage is specifically of greater interest to athletes while talking about body composition, since it is often negatively associated with athletic performance. Athletes for a specific sport represent a unique body composition. Density of fat free mass alters with changes in proportions of fat free mass components. Greater lean body mass, strength, power, lower body fat percentage and earlier maturation are associated with young, elite male athletes. While on the other hand, young, elite female athletes have lower percentage of body fat, later maturation and a less "curvy" physique. Sportspersons and athletes have a different physiology and health consequences associated with their body composition compared to the general non-sports playing group, making body composition is an important field of study in sports physiology. For achieving excellent performance in sports and athletics, physical characteristics and body composition have been known to be instrumental to refine and work upon. Body composition can act as a predictor of athletic performance, making it relevant for both athletes and coaches. Physical performance tends to decline with increasing body mass and fat percentage, one or the other reaching to extreme levels. However, complementary nature of a higher or lower body fat content is driven by the type of sports activity that has to be performed. That is why, the body composition trends specific to different sports could provide a way out for 188 Factors Affecting Physical Performance identifying and categorizing the potential part identifying and categorizing the potential participants for a particular event/activity.

Body composition becomes a safety issue in weight-dependent sports, like wrestling. Body fat percentage is an important factor in endurance events because extra fat increases the demand of energy needed for running without giving any extra energy in return. There exists a significant relationship between body fat percentage and running performance. Lean body mass, on the other hand, acts as a better predictor of performance than fat mass in strength events. Excess of body fat has harmful effects on the performance in most of the sports whereas, fat free body mass, specifically muscle mass, and is generally related with highly refined performance.

4. Nutrition

It is the intake of food, in relation to the dietary demands of an organism which is dealt under the scope of nutrition and nutrition-based studies and research. Good nutrition in an adequate amount or what is popularly known as the "balanced diet" when combined with regular, adequate physical activity forms one of the cornerstones of sound health. Basic understanding of nutrition and its effects upon health, weight control and physical performance is a matter of immense significance. Poor nutritional condition majorly reduces immunity, increase susceptibility to diseases, lead to impaired physical and mental development, and reduce productivity.

Following Nutrients form Constituents of Every Diet:

Carbohydrates furnish energy to the millions of cells within the human body. They are classified as monosaccharides, disaccharides, or polysaccharides. The most common monosaccharide carbohydrate is glucose which

is oxidized and used directly by the body for energy, broken down by the digestive system, converted into glycogen (a polysaccharide) and stored in the muscle and liver for later use. However, if the storage capacity for glycogen is exceeded in muscles and liver, the excess glucose is converted into fat and stored in the fatty adipose tissue of the body. Therefore, if a person is on a high carbohydrate and low-fat diet, it is still possible for that person to increase his / her fat level.

Fats have several major functions in the body, such as- (i) energy storage which can be used as fuel as the body needs it, (ii) carrier for soluble vitamins A, D, E and K throughout the body, (iii) providing soft cushion against inside and outside shocks or blows to vital organs such as the heart, lungs, kidneys, liver, spinal cord, etc., (iv) heat insulator to protect body against cold weather and (v) retarding or depressing hunger pangs. Fat molecule consists of carbon, oxygen and hydrogen. Fats contain lesser oxygen and more carbon and hydrogen than carbohydrates, thus acting as greater fuel provider but has a greater oxidation cost. Chemically, a fat molecule is made up of fatty acids and glycerol. Fats are stored in the body in the form of triglycerides.

Proteins contain nitrogen in addition to carbon, oxygen and hydrogen. Proteins are "building blocks" of tissue, so every cell in the body needs protein. They furnish the basic material for muscular contraction. Proteins are made up of nitrogenous compounds called amino acids which are of 20 different types, of which 8 are essential and are not synthesized within body. The essential amino acids are obtained directly from diet are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.

Vitamins are organic substances that are essential for human life. Living cell cannot manufacture vitamins, so they are to be provided either in diet or through supplements. They are generally classified as water soluble and fat soluble. Fat soluble vitamins are composed of carbon, hydrogen and oxygen, whereas water soluble vitamins contain nitrogen, cobalt and sulphur in addition to carbon, hydrogen and oxygen. Fat soluble vitamins can be stored in body whereas water soluble vitamins could not be stored in body.

Minerals, like vitamins, provide no energy however each mineral has a diverse function which is vital for proper functioning of the body. Minerals are essential for the formation and maintenance of bones, teeth, muscles, cells and certain connective tissues, body fluids, hormones and enzymes. They make up approximately 4% of the body weight. Mineral deficiency can lower an athlete's efficacy. Depleted minerals during exercise can be replaced by diet or through supplementation.

Water makes up 40%-60% of the total body weight but it is not classified as an energy nutrient. Water not only provides the medium for all chemical processes to take place in, but it also assists in forming blood plasma, digestion of foods, glandular secretion and in waste elimination.

Recommendations on current energy, nourishment-demands and optimum liquid-intake for active adults and competitive athletes:

For high-intensity training, adequate energy needs are critical to keep a check over body weight, maximize effects of training and maintain a healthy state. Otherwise, the lower energy intakes would result into degeneration of muscle mass, menstrual dysfunction, loss of bone mineral density, and failure to regain the bone density. It may also lead to increased frequencies of fatigue, injury and illness relating events. Body weight and its composition have an upper hand in exercise performance, significantly influencing it. But those being the sole criteria for deciding participation in sports this consideration could later prove to a fallacy. Therefore, daily weighing is and should be discouraged. Age, sex and hereditary factors play key role at deciding, along with the type of sports they are to play, the varying levels of optimal body-fat among players. However, desired management of weight and fat should start early before the competitive season, under close supervision of a trained health and nutrition professional.

Carbohydrates chiefly regulate the glucose levels in bloodstream and muscle glycogen replacement mechanism. During exercise, the recommended quantities of carbohydrates for athletes range from 6 to 10 grams for per kilogram of the body weight, per day. Required nutritional count is decided upon by an athlete's total energy expenditure that they are about to make during the activity event, type of sports

activity to be performed, gender-based differences and environmental conditions. Protein requirements are recorded to be considerably more in highly active people. Protein recommendations for endurance athletes tend to be 1.2 to 1.4 g/kg of the body weight on a per day basis. While for resistance and strength trained / training athletes, it should be as high as 1.6 to 1.7 g/kg of the body weight, per day. Even without the use of protein or amino acid supplements, such recommended protein intake amounts could generally be met through diet alone, provided that the energy intake is adequate to maintain body weight.

Now, it is important to note here that no significant benefit is added to the performance upon consuming diet that contains less than 15% of energy compared with 20% to 25% of energy sourced from fats, for which its intake should not be restricted. Fats form an important portion in the diets of athletes. Reason being, it not just provides energy but also supplies with fat-soluble vitamins (vitamin A, D, E, K) and some very essential fatty-acids. Additionally, there is lack of research and data on which scientific basis using recommended levels of fat could be used for athletes furnishing them in their diets. Practices like restricting energy intake, using severe weight-shedding practices, excluding one or more food groups or items from diet, consuming more of carbohydrate-rich diets with reduced micronutrient density could pose bigger risk of developing micronutrient deficiencies among the athletes. For this, they should consume diets providing at least the Recommended Dietary Allowances / Dietary Reference Intakes RDAs / DRIs for ensuring that different micronutrients in the food are reaching to the body.

Adequate intake of liquids before, during and after exercise is crucial for optimal health and performance as dehydration decreases exercise performance. That is why athletes are advised to drink enough fluid to balance the fluid losses. They should consume 400 to 600 ml (14 to 22 oz) of fluid two hours before exercise and another 150 to 350 ml (6 to 12 oz) of fluid contents should be taken in every 15 to 20 minutes while doing the exercise depending up on its tolerance (i.e., frequency, intensity and duration of the exercise). Once an exercise gets over, it highly advisable for an athlete to drink adequate quantity of fluids to replace exhausted mineral and electrolytes with sweat losses occurred while exercising. At least 450 to 675 ml (16 to 24 oz) of fluid intake is again suggestible for every pound (0.5 kg) of body weight to replenish as it gets lost during exercise through perspiration. Meal / snack provided before exercise should consist of sufficient amounts of fluid for maintaining hydration levels, optimally. Such items should be relatively low in fat and fibre as then it enables gastric emptying and reduced gastro-intestinal distresses. Rather the diet should be relatively carbohydrate rich enough to promote proper maintenance of glucose concentration in bloodstream. In addition to this, the diet requires being moderately rich in proteins and composed of foods familiar and well tolerated by the athlete's body and digestive tract.

In nutrient consumption the primary goal during exercise is to maintain the blood glucose levels by replenishing fluid and essential-mineral losses and further supply sufficient carbohydrates (approximately 30 to 60 g per h) to the active ends and muscles in body. All of these guidelines about the nutritional know-how are important, especially for endurance events that may generally last for longer than an hour. Following these nutritional cautions is even more vital when the athlete could not consume adequate food or fluid before starting with their exercise. It is instrumental to abide by these guidelines when the athlete is exercising in an extremely distressing environment (that could be heat, cold or altitude). Major dietary goal, after exercise, is to keep offering sufficient dynamism from the carbohydrates count for ensuring rapid recovery and regain of muscular glycogen. Carbohydrate intake of 1.5 g/kg of body weight during the first 30 minutes is much-needed when the athlete is glycogen-depleted after an exercise and then again after every 2 hours for 4 to 6 hours is sufficient for replacing the glycogen stores. Protein consumed during an exercise or after an exercise generates amino acids for building and repairing tissues at different muscular regions. Therefore soon after a strenuous competition or training session athletes should willingly consume a mixed or what is generally known as the "balanced" meal that must be supplying enough carbohydrates, protein and fat.

It implies that no extra vitamin and / or mineral supplements would actually be required if the athlete takes necessary energy share from various food items, ultimately contributing to

the maintenance of ideal body weight with respect to the concerned sports / activity. Supplementation recommendations unrelated to exercise demands such as those for folic acid use in women of childbearing potential and among others requiring it should be followed, if needed. A multivitamin / mineral supplement is the most appropriate demand for if an athlete is following diet planning and charting / looking for eliminating foods or food groups when unwell or recovering from any sort of injury, or bearing some specific micronutrient deficiency. No supplementation of nutrients is advisable except for specific medical or nutritional reason / prescription such that in the case of iron deficiency anemia where iron supplements are prescribed and used to reverse its affects.

It is here that the athletes should be counselled about utilizing nutritional "ergogenic" aids and assistance; that must be employed with great caution. It should only after careful evaluation of such products on the grounds of their safety, efficacy, potency as well as legality affairs that they can be utilized. It is only after careful review of health, diet, supplement and drug use, and energy requirements of the athlete by a qualified nutrition expert that the nutritional advice is provided and should be seek upon. On dietary grounds, vegetarian athletes have been found at a higher risk for being a deficient of energy, protein contents and other vital micronutrients. It is mainly attributed to the tendency of high intakes of low-energy-dense foods and the exclusion of meat and dairy foodstuffs from essential meals and diet. Consultation with a registered dietitian for possible substitutes of the lacking nourishment could help to avoid these nutritional problems

5. Relation Between Body Physique and Composition with Performance

Athletes meant for a specific sport denote a unique body composition. Athletic talent, accomplishments and propensity for a particular sport greatly depend upon physical characteristics, proportionalities and body composition that are instrumental to refine and to be worked upon. Sports persons and athletes have a different physiology and health consequences associated with their body composition compared to the non-athletic group. Body composition acts as a predictor of athletic performance. Ratios of different body dimensions with stature are extremely vital in sports as for they are related to a person's physical ability to meet the biomechanical demands of a particular sport or the playing position. Body weight and fat percentage, at extreme levels, associates with declining/negative sports performance, whereas fat-free mass specifically muscle mass relates closely with highly refined performance. Quality of an individual's movement and efficiency of skills about its utilization is directly proportional to the level of performance.

Body fat percentage is noteworthy in endurance events. Extra fat intensifies the demand of energy needed for functioning without giving any extra energy in return. Excess fat at a given level of applied force resists change in velocity. So, excess of fat adds non-force producing mass to total body weight, eventually reducing performance. Body composition trends, hence, help in categorizing the potential of participants for particular sports event. Body mass index is used widely among adults for clinical and epidemiological assessments. However, it is important to note here that BMI is influenced by both fat mass and fat free mass. Most of the heavy weight boxers are overweight according to BMI standards but not fat. This is the reason BMI alone is not a reliable index for assessment of the status of body constitution of a sports person. On the other hand, skinfold thicknesses are much easier and economical to obtain, constituting part of subcutaneous fat density used to predict total body fat; forming about half of the total body fat percentage ratio.

Studies conducted over Olympic players indicated that successful sports performance is often obstructed by lack of appropriate physique. Morphological optimization is associated with success in different sports. Studies on athletes have revealed sprinters are usually muscular, while marathon runners are small in size and leaner. Throwers are taller and heavier, with higher levels of fat being favourable for their excellence. Defensive linemen in football tend to have higher body fat than defensive backs. In track and field events, sprinters are supposed to have lower body fat than a thrower. Having higher body fat and body mass is supported among the athletes involved in events like swimming and kayaking. Athletes trained in weight bearing, or anaerobic sports like running / sprinting, it is instrumental for them to have much lower body fat percentage.

In sports specifically requiring body projection

such as jumping movements against gravity, excess fat and body weight has been found hampering sports performance. For long distance swimming and water polo, moderate level of fat is considered as an asset to performance as it provides additional buoyancy. This is the reason elite swimmers have optimal level of fat in their body. Jumpers are selected and later trained mainly for their long legs, short trunk and broader feet because height and long legs help them to have their centre of gravity at a higher level which helps them in crossing greater height. Power to weight ratio is significant for jumpers, thence maximizing muscle mass and maintaining low body fat level is desirable. Throwers are must to have greater body weight because when an object is thrown forward and upward, an equal and opposite force is exerted on the thrower which disturbs his / her body balance. Effect of this reaction will consequently be more if the athlete does not have higher body weight. Further to make the flight of the throwing object longer in air, greater height is also advantageous for such athletes. Height gives an edge to basketball and volleyball players helping them to excel as it is an advantageous factor for these players.

It has been witnessed that shorter body frame helps athletes to excel in the field of gymnastics, weight-lifting class in boxing. China, Korea and Japan have produced more sports persons in the field of gymnastics as shorter height is more favourable in gymnastics. In the field of throwing events and heavy weight class in boxing bulky musculature helps the sports person in bringing laurels. Europeans have proved their sports acumen in volleyball, basketball, swimming, long jump, shot-put; credited to their taller height.

6. Role of Nutrition in Performance

High physical activity based performances are feasible only with the procurement of considerable amount of energy and essential macronutrients, in advance. Here carbohydrate based energy and protein intake demands specially must be addressed wisely to uphold the standard body weight, replenish the depleted glycogen reserves stored in body and offer ample of proteins for the maintenance and restoration of used and worn-out tissues and muscles. Intake of fatty contents monitored carefully, has to be plenty enough to endow the body with all the essential fatty acids and fat soluble vitamins, crucial for upholding sufficient stock of energy for maintenance of weight. So, overall diets given to athletes should provide them with moderate amounts of energy from fat, i.e., up to 20% to 25% of energy. Body weight and composition though tend to affect performance during exercise but that should not be considered as the only criterion for gauging performance in sports; hence daily weighing should be avoided.

Having sufficient energy and fluid content before an exercise, during its achievement and after its completion has crucial role to play in maintaining the well-being and enhancing performance of player. This ensures retaining normal blood glucose concentrations during exercise, which thus maximises exercise performance and improves recovery time from the mechanically stressful event. Athletes should be taken care for being well hydrated before beginning with the exercise. To balance the fluid losses they must drink adequate amount of fluid during and after exercise. During exercise muscles must be provided with required amount of fuel, blood glucose and thirst mechanism needs to be maintained so as to decrease risk of dehydration or hyponatremia. Sport drinks containing carbohydrates and electrolytes can be consumed for this. Athletes do not need any further vitamin and mineral supplementation if an adequate amount of energy, to keep up with an appropriate body weight, is consumed from various sources and foods. However, additional supplements may be needed by those specifically restricting their energy intake by employing severe weight loss practices and also the ones looking at eliminating one or more food groups completely from their diet. Moreover, those consuming foods high on carbohydrates but lower micronutrient density would specially need to rely upon additional supplementation, for sure.

The effects of nutrition on exercise performance have been clearly documented in various researches. Whatever an athlete eats or drinks, undoubtedly it has an impact over their health, body physique and composition, substrate the exercise duration, its recovery time and ultimately the performance too. For optimisation of exercise performance one needs to follow good nutrition and hydration practices, follow careful use of ergogenic aids and supplements, avoid severe weight shedding practices and eat foods from different sources in adequate measures. Addressing nutritional and energy

needs holds a priority for athletic performers. An efficient energy balance is crucial to maintain optimal tissue masses, immune functions and desired athletic performance. Energy balance refers to the state when energy intake meaning the sum of energy gained from food, fluids and supplements gets equal to the energy expenditure which is the sum of energy expended at basal metabolism by the "thermic" effect of food as a result of digestive processes and any form of voluntary physical activity, if undertaken. Energy intakes when remain inadequate relative to the magnitude of energy to be expended leads to compromising with desirable performance results and benefits associated with the training regimes. Fat masses are used by the body as reservoirs of fuel when there are limited energy intakes. This is the time when loss of muscle in such situations takes place which then results into the loss of muscular strength and endurance. Continual low energy intake after a point of time will lead to deficiency of nutrients, particularly of the essential micronutrients.

RDAs (Recommended Dietary Allowances, 2010) mean energy requirements put forth for women and men who are just slightly to moderately active in 19 to 50 years of age are defined as 2,200 and 2,900 kcal per day, respectively. For normally active people, they are counselled to consume an energy equivalent of 1.5 to 1.7 times of resting energy expenditure or at a rate of 37 to 41 kcal/kg of the body weight, per day. Expenditure of energy is under constant influence from heredity, age, sex, body size and composition, the intensity, frequency and duration of exercise. These numeric guidelines for energy intake can ultimately only estimate a crude approximation of the average energy requirements of an individual athlete that does not fit to the other performer, as one solution here does not fit all.

Every athlete must consume sufficient energy contents to maintain appropriate weight and body composition essential while obtaining training for a particular kind of sport. Usual energy intakes recommended for male endurance athletes ranges between 3,000 to 5,000 kcal on per day basis. And for female athletes, though the usual energy intakes (per kg of body weight) are dependent upon the training regimens intensely match those of male athletes, but some female athletes consume lesser energy sources than they expend. Such low energy intakes, like less than 1,800 to 2,000 kcal per day, over a longer run tend to cause reduction in weight. Resistance exercises usually require less energy than endurance exercises. But the total energy demand of athletes, for their increased body size and high levels of fat free mass, participating in strength training and body-building may be as high as those of endurance athletes. Instances where an increased lean body mass is the prime goal, energy intakes must be considered sufficient to meet the needs for growth of the respective muscles, that is why many of the strength athletes need is about 44-50 kcal/kg body weight on per day base, while those in serious training may have and experience even much higher energy requirements; even more than 50 kcal/kg body weight per day!

Physical activity, exercise / activity performance and finally swift recovery from exercise test phase could be improved a lot by optimal nutrition it has been suggested by the "American Dietetic Association", the "Dietitians of Canada" and the "American College of Sports Medicine". These organizations have actually provided recommendations for selecting food and fluids appropriately. Timing of food intake and supplement choices are highly significant for achieving optimal health and exercise performance. However, sport nutrition experts can further modify these general recommendations to meet even the unique concerns of individual athletes about matters like health and well-being, sports, nutritional needs, dietary preferences, and body weight and composition goals.

7. Summary

There are various factors which affect performance in sports and games physique, training, skill, age, motivation, etc. physique is the most fundamental of all the factors. The physique of an individual can be evaluated from body dimensions, proportions, components and by somatotyping. To excel in a physically competitive sport, the player must possess dimensions of body characteristics which suit in his / her sport. It is because of this reason; the kinanthropometric or physical characteristics are known to be of fundamental importance for individual development to achieve high level performance in sports. Physical activity, athletic performance and recovery from exercise relating stress can be improved upon by optimum nutritional intakes. As part of nutritional

conditioning, suitable selection of foodstuffs and liquids, timings of their intake and supplement nutrition choices is crucial for achieving optimal health and exercise performances.

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