Bölüm

2

Adale Dinlenmeli

Adalenin Çalışması için Enerji gereklidir *

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Bir atlet ile konuşmanın sunulmasıdır.
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Adalenin çalışması için enerjiye gereksinim vardır, bunun enerji içecekleri ile alınmasının bir bilimsel boyutu olmadığı konusu vurgulanacaktır. Temelde şekerin laktik asit üretimine katkısı nedeniyle adalenin yorulması, ağrısı ve spazm oluşması nedeniyle ters etkileşime neden olabileceği de belirtilmektedir.

Sizin adalelinizi çalıştırırken, enerji gereksinimi olacağı belirgindir. Bunun için beslenme, besin kontrolü önemlidir.

Sıklıkla enerjinin temini konusu gündeme getirilmektedir. Ancak, günlük spor, egzersiz yaklaşımında ek kalori, enerji desteğine gereksinim yoktur. Bilakis vücut yağının yakılması için ek kalori alınmaması önemlidir.

Özet

Adalenin Çalışması için Enerji gereklidir

Amaç: Spor, egzersiz yaklaşımı açısından sıklıkla ek enerji gereksinimi olacağı algısı ile şekerli ve kalorili sıvı içecekler içilmektedir ki bu makale bunun gereksizliğini belirtmektedir.
Dayanaklar/Kaynaklar: Wikipedia, Google ve bireysel deneyimler ile vurgular yapılmaktadır.
Genel Yaklaşım; Bir egzersiz, bireye göre, sağlık ve sıhhat durumuna göre, kalp atımı ve diğer biyokimyasal verilerine göre yapılmalıdır. Bu açıdan her yaklaşım, belirli dayanak ve gerekçelere göre yapılmalıdır.
Yaklaşım: Bireyin spor yaklaşımında genel yaklaşım boyutu öne çıkarılmaktadır.
Sonuç: Tüm veriler bireye göre irdelenmeli ve bedenin aerobik, oksijen kullanması ile, anaerobik, laktik asiti metabolize etmesi ve ATP yükü; enerji depolamasına göre yaklaşım yapılmalıdır. Bu açıdan her birey, yaklaşımlarını, spor plan ve projelerini belirli sağlık uzmanları temelinde yaklaşım yapmalıdır.
Yorum: Spor, bireye özgü yapılmalı, sağlık ve sıhhat temelinde olmalıdır.
Anahtar Kelimeler: Spor ve sağlık, bedensel kapasite ve enerji temini

Outline
Energy is Essential for Muscular Effort

AIM: Sport and exercise approach, mostly energy is extra required considerations, thus, this is not a reality and essential for routine, personal needs. Only athletes and record-breaking person have need extra energy.

Grounding Aspects: Wikipedia, Google and personal thoughts is mentioned.

Introduction: Exercises for individual concept, capacity, form health aspects, by hear rate, and other biochemical considerations, leading the plan and hardness. All have a scientific grounding on personal perspectives.

Notions: Individual specifications is essential and important.

Conclusion: The sport and exercise adapted to individual reactions as aerobic; oxygen consumption type, anaerobic; lactic acid cycle and ATP storage, thus, the efficiency, based on medical considerations for healthy person.

Key Words: Sport and Health, exercise capacity, energy requirement

Giriş

Adaleler karşı bir güç olması ve buna karşı gelmeleri ile güçlenmektedirler. Adale yapısındaki oluşumlar daha güçlü olarak kasılarak, belirli boyuta ulaşabilirler.

Her adalenin ters tarafında, biri kasılırken, diğeri gevşeyerek eylem yapılır. Bu açıdan adalelerin güçlenmesi için mutlaka bir güç, kuvvet bulunması gerekmez. Basit olarak adaleleri kasmak bile bir boyutu oluşturabilir. Gerçekte diz ekleminin güçlenmesi için, ayağı uzatıp, kasmak ile en ideal boyuta ulaşılabilir. Aerobikler, yürümeler, yüzmeler belirli bir güç kullanılmadan, doğal şekilde yapılması ile bir düzene, bir sağlıklı yapıya ulaşılacağı anlamındadır.

Burada dikkate alınması gereken durum, bir kişi yürüyorum diyerek, daha fazla enerji almasının gerekmediğidir. Yaşamda sağlıklı olunması için bedensel harekete gereksinimi vardır ama bunu yapıyorum diyerek daha fazla enerji alması gerekli değildir.

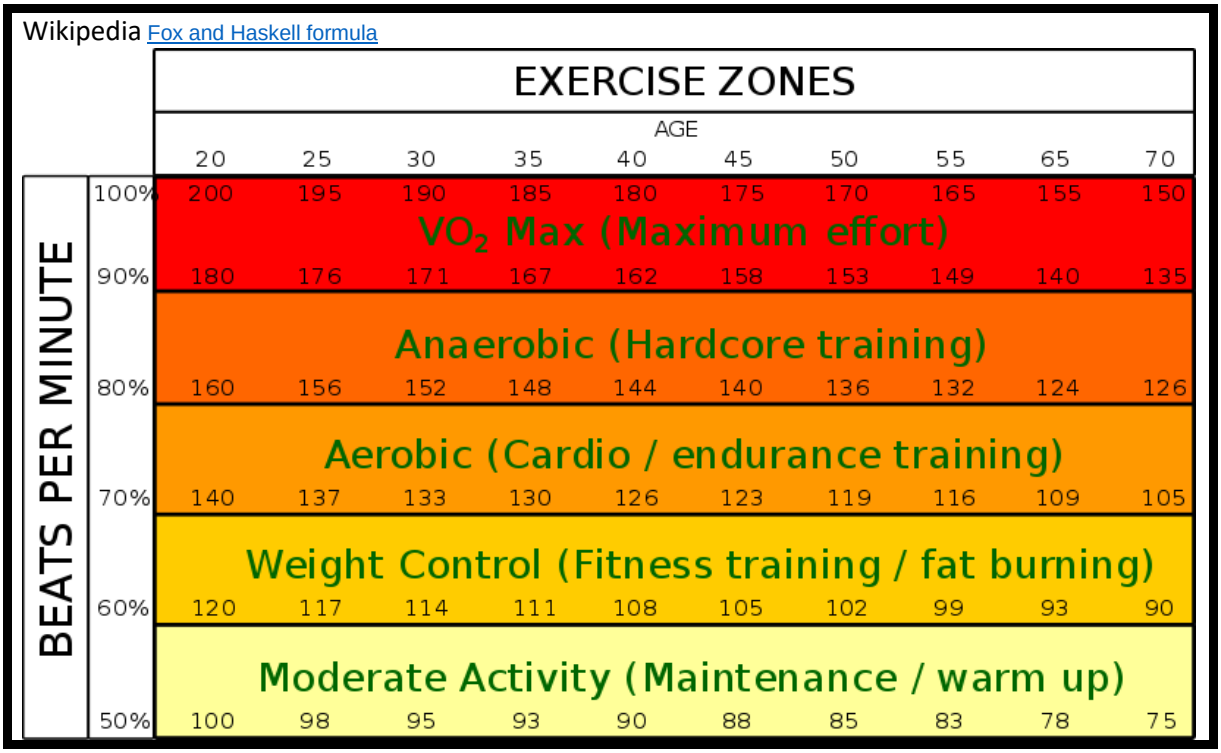
Ağır spor yapanlar, ağır bedensel işçiler veya amacı uzun ve ağır bir spor aktivitesi olanlar için, onların işleri, yapacakları adale bağlantısı olduğundan dolayı, yüksek kaloriye gereksinimleri vardır. Ancak gereken aynı zamanda mitokondri ve enzimlerin güçlenmesi de olduğundan dolayı belirli kaliteli proteinde almalı, yapıma da gitmelidirler. Adalede olan kreatinin fosfat etkisi de önemlidir.

Bu açıdan dikkat edilmesi gereken boyutlar şunlardır;

a) Isınma hareketi; adalelerin gücünün korunması amacı ile kalbin 100 atım civarında olan bedensel hareketler
b) Sağlık için; Bedenin çalışması, yağların yakılması ve adalelerde mitokondri yapılanması amacı ile olan ve kabaca 120 atım dakikada nabzın korunması
c) Eğitim amaçlı; Spor, futbol ve bir oyunda harcanan güç, burada da beklenen kalp atımı 140 atım dakikadadır
d) Zorlama; Adalelerin zorlanması, adalelerin geliştirilmesi ve solunum ile oksijenlenmenin yetersiz kalması ile laktik asidozun başlaması, kalp atımının 160 atım olması durumu
e) Maksimum güç kullanımı; enerjinin tam tükenmesi ve soluk, soluk kalma boyutu, kalp atımının 180 atım civarına çıkmasıdır.

NOT: Efor testlerinde yaşa göre uyarlanan yaklaşım ile, 20 yaşında bir kişinin 180 nabız ve üstünde bir eforlu işlev yapmamalıdır. 70 yaşında birisi için bu 135 atım dakikadır.

Egzersiz Boyutları: yaşa göre kardiyak atım ve egzersiz boyutuna göre irdeleme



Şekil 1: Adalelerin zorlanması; a) ısınma hareketi, b) sağlık için, c) eğitim amaçlı, d) zorlama, e) maksimum güç kullanımı

Genellikle koşarken, idman bisikleti ve spor yaparken kola takılan aletlerin nabzı ölçtüğü ve 140 üstüne çıkınca (70 yaşında ise 105 üstünde) durdurulmalıdır.

Adalelerin çalışmasına göre ancak akciğerler yeterli olabilir. Fazla çalışması durumunda, kalbin 160atım/dak üstünde yetersizlik gözlenmektedir. Burada artık yeterli dur mesajı iletilmekte, ancak beyin bunu algılamalıdır. Denizde algılamaz ise, ileti bozulması, kasılma ve ayağa giren kramp nedeniyle ölümlere bile neden olabilecek boyut gelişebilir.

Büyüme ve gelişmede, bireye göre farklı olsa da kabaca bir gelişim gözlenir.

- 20-24 Gebelik Haftasına kadar yalancı kanaliküler yapı, respiratuvar bronşiol etkili
- 30-35 Gebelik Haftasında sakküler yapı, Keseleşme, lastik gibi değil
- 36+ Gebelik Haftası alveoler yapı başlamış ama etkinlik zayıftır
- 39+ Gebelik Haftası surfaktan dahil olgunlaşma ancak yeterli olmuştur
- 2-7 Yaş akciğer kendi içinde bölünmesi ve anatomik gelişim deva etmektedir.
- 15-16 Yaşında fizyolojik gelişim tamamlanmıştır.
- Adale ise 25 yaşına kadar gelişir ve güçlenir. Bu açıdan bir yüzücünün rekor kırabilmesi için son yaşları 18 civarındadır. Bu nedenle adale değil, akciğer kapasitesi bir yüzücünün adale gücünü tanımlar.
- Koşma gibi işlevlerde ise adale gücünün etkisinin azalması ile 30 yaşlarında son bulmalıdır. Bundan sonra eğitici, Takım Kaptanı, Koç veya Mentor olmalıdır.
- Oyun kuruculu bir beyin işlevidir, 5-9 yaşında kapmalıdır. 16 yaşı tepe noktasıdır, daha sonrası değil, daha öncesi sporcunun gelişimi, oluşması için önemlidir. Sporcular 5 yaşında seçilmesi ve yetiştirilmesi önemlidir.

Kaynaklar

Adalelerin güçlenmesi açısından spor boyutu ile enerji temini birlikte irdelenmesi yararlı olacaktır.

1) Training effect (Wikipedia)

Training effect refers to specific changes in muscular, cardiovascular, and neurohumoral systems that lead to improvement in functional capacity and strength due to regular endurance or resistance training.[1] It has also been defined as a reaction to the adaptive responses of the body created by a training program[2] or as "an elevation of metabolism produced by exercise".[3]
Kenneth H. Cooper for the United States Air Force discovered this effect in the late 1960s and coined the term.[4]
The measured effects were that muscles of respiration were strengthened, the heart was strengthened, blood pressure was sometimes lowered and the total amount of blood and number of red blood cells increased, making the blood a more efficient carrier of oxygen. VO_2 Max was increased.[citation needed]

Contents

Exercise

The exercise necessary can be accomplished by any aerobic exercise in a wide variety of schedules - Cooper found it best to award "points" for each amount of exercise[5] and require 30 points a week to maintain the Training Effect.[citation needed]
Cooper instead recommended a "12-minute test" (the Cooper test) followed by adherence to the appropriate starting-up schedule in his book. As always, he recommends that a physical exam should precede any exercise program. (A newly recognized effect is that of Exercise hypertension, for which there is a medical test.)[citation needed]
The physiological effects of training have received much further study since Cooper's original work. It is now generally considered that effects of exercise on general metabolic rate (post-exercise) are comparatively small and the greatest effect occurs for only a few hours. Though endurance training does increase the VO_2 max of many people, there is considerable variation in the degree to which it increases VO_2 max between individuals.[6]
Tudor Bompa has classified training effect into three categories: immediate training, delayed, and cumulative.[2]

Training Effect Feature

Training Effect can also refer to a feature available in a number of health and fitness devices.
As a feature, Training Effect appears in devices from Garmin, Suunto, Jabra, Huawei, Bosch, and appears in Samsung devices as a guidance function. It is licensed by Firstbeat and predicts the physiological impact of physical activity based on the user profile and an analysis of heartbeat data. The analysis produces an estimate of EPOC accumulated during the session, and provides feedback scaled to the users personal fitness levels[7].

Yorum

Adalelerin işlevinin boyutu, onların metabolik dengesi ve egzersiz ile oksijen kullanımı ile zorlanmalarının sağlık açısından da önemi belirgindir.

Burada sık kullanılan koşma yeteneği ortaya konulmaktadır. Bu durum, kardiyolojinin efor testi olarak belirtilen şeklindedir. Efor testine koşulan mesafe değil, kalp atımlarına göre kardiyak cevap olarak bakılmaktadır. Ayrıca istirahate geçebilme ve durgun süreç te değerlendirme kapsamındadır.

Cooper test (Wikipedia)

The **Cooper test** is a test of physical fitness. It was designed by Kenneth H. Cooper in 1968 for US military use.[1][2][3]

- In the original form, the point of the test is to run as far as possible within 12 minutes.
- The test is meant to measure the condition of the person taking it and therefore it is supposed to be run at a steady pace instead of sprints and fast running.
- The outcome is based on the distance the test person ran, their age and their sex.
- The results can be correlated with VO_2 Max.
- It is an easy test to perform on larger groups.
- For athletes, the length of the run is considered to be that of a long distance run, since everything above 3 km is rated "long distance"—which means the runner will predominately use his/her "red", slow oxidative muscle cells.
    - For comparison the 5000 meters world record of Kenenisa Bekele is 12:37.35.[4] This means that in 12 minutes he would reach a distance of around 4750 meters.

Results interpretation

The following is an example of the many tables that exist for the test:

Cooper test (Athletes & Juniors)						
Age	**M/F**	**Very good**	**Good**	**Average**	**Bad**	**Very bad**
13-14	M	2700+ m	2400 - 2700 m	2200 - 2399 m	2100 - 2199 m	2100- m
	F	2000+ m	1900 - 2000 m	1600 - 1899 m	1500 - 1599 m	1500- m
15-16	M	2800+ m	2500 - 2800 m	2300 - 2499 m	2200 - 2299 m	2200- m
	F	2100+ m	2000 - 2100 m	1700 - 1999 m	1600 - 1699 m	1600- m
17-20	M	3000+ m	2700 - 3000 m	2500 - 2699 m	2300 - 2499 m	2300- m
	F	2300+ m	2100 - 2300 m	1800 - 2099 m	1700 - 1799 m	1700- m
20-29	M	2800+ m	2400 - 2800 m	2200 - 2399 m	1600 - 2199 m	1600- m
	F	2700+ m	2200 - 2700 m	1800 - 2199 m	1500 - 1799 m	1500- m
30-39	M	2700+ m	2300 - 2700 m	1900 - 2299 m	1500 - 1899 m	1500- m

	F	2500+ m	2000 - 2500 m	1700 - 1999 m	1400 - 1699 m	1400- m
40-49	M	2500+ m	2100 - 2500 m	1700 - 2099 m	1400 - 1699 m	1400- m
	F	2300+ m	1900 - 2300 m	1500 - 1899 m	1200 - 1499 m	1200- m
50+	M	2400+ m	2000 - 2400 m	1600 - 1999 m	1300 - 1599 m	1300- m
	F	2200+ m	1700 - 2200 m	1400 - 1699 m	1100 - 1399 m	1100- m

Cooper test (Experienced athletes)					
Gender	**Very good**	**Good**	**Average**	**Bad**	**Very bad**
Male	3700+ m	3400 - 3700 m	3100 - 3399 m	2800 - 3099 m	2800- m
Female	3000+ m	2700 - 3000 m	2400 - 2699 m	2100 - 2399 m	2100- m

Practical

For practical use, precise monitoring presents a challenge. Not all military bases have a running track, and tracking soldiers' laps and positions after 12 minutes is difficult. Testing is easier to administer when the distance is fixed and the finishing time measured. In his original book Dr. Cooper also provided an alternate version of the test, based on the time to complete a 1.5 mile run.[1]

Most armies and police agencies of the world use a fixed distance. This is not exactly a Cooper test but a reasonable practical compromise as long as the distance is of sufficient length to put a continuous load on the cardiovascular system for 10+ minutes. For example, the British Army uses 1.5 miles, the Australian Army uses 2.4 kilometers, the US Army uses 2 miles and the US Marine Corps 3 miles. For each base the course is measured and local corrections (elevation, conditions, etc.) applied. Soldiers are sent off in waves, and timed over the finish line by some PTIs with a stopwatch.

For personal trainers, the Cooper Test, when carried out on a treadmill, is a reliable and repeatable method for measuring a client's progress. As a standard test this test should to be performed only under standard conditions:

- Between 50 and 75° F (10 to 25°C) with 75% maximum humidity.
- On a standard 400 m tartan track or similar.
- The candidate should not suffer from respiratory problems.

The test is not considered to be useful for untrained pupils at all.[5]

Use of Cooper Test for football referees

Cooper test was one of the most commonly used fitness tests to measure the fitness levels of both amateur and professional football referees; including referees from the FA (English Football Association). However, in recent times, many countries have decided to abort the use of the Cooper Test. They claim that the Cooper test does not relate to a real football match, where players run short sprints rather than at a regular pace, and therefore, does not truly indicate if a referee will be able to perform well in a football match. As such, all FIFA referees are now required to pass the HI Intensity Fitness Test. Many countries are slowly requiring some of their top National officials to do the HI Intensity Fitness Test as well. Lower level referees are often given a choice to either perform the HI Intensity Fitness Test or the Cooper Test. Nevertheless, the recent trend seems to indicate that the Cooper Test is slowly being phased out.[6][7][8]

Yorum

Burada bedensel açıdan değerlendirmenin bir form olarak tanımlanması belirtilmektedir. Şekil 1'de olan daha sağlık verisi açısından uygun niteliktedir.

2) Muscle fatigue

Muscle fatigue is the decline in ability of a muscle to generate force. It can be a result of vigorous exercise but abnormal fatigue may be caused by barriers to or interference with the different stages of muscle contraction. There are two main causes of muscle fatigue: the limitations of a nerve's ability to generate a sustained signal (neural fatigue) and the reduced ability of the muscle fiber to contract (metabolic fatigue).

Muscle contraction

Muscle cells work by detecting a flow of electrical impulses from the brain which signals them to contract through the release of calcium by the sarcoplasmic reticulum. Fatigue (reduced ability to generate force) may occur due to the nerve, or within the muscle cells themselves.

Nervous fatigue

Nerves are responsible for controlling the contraction of muscles, determining the number, sequence and force of muscular contraction. Most movements require a force far below what a muscle could potentially generate, and barring pathological nervous fatigue, is seldom an issue. But in extremely powerful contractions that are close to the upper limit of a muscle's ability to generate force, nervous fatigue (enervation), in which the nerve signal weakens, can be a limiting factor in untrained individuals.

In novice strength trainers, the muscle's ability to generate force is most strongly limited by nerve's ability to sustain a high-frequency signal. After a period of maximum contraction, the nerve's signal reduces in frequency and the force generated by the contraction diminishes. There is no sensation of pain or discomfort, the muscle appears to simply 'stop listening' and gradually cease to move, often going backwards. As there is insufficient stress on the muscles and tendons, there will often be no delayed onset muscle soreness following the workout.

Part of the process of strength training is increasing the nerve's ability to generate sustained, high frequency signals which allow a muscle to contract with its greatest force. It is this neural training that causes several weeks worth of rapid gains in strength, which level off once the nerve is generating maximum contractions and the muscle reaches its physiological limit. Past this point, training effects increase muscular strength through myofibrilar or sarcoplasmic hypertrophy and metabolic fatigue becomes the factor limiting contractile force.

Metabolic fatigue

Though not universally used, 'metabolic fatigue' is a common term for the reduction in contractile force due to the direct or indirect effects of two main factors:

1. Shortage of fuel (substrates) within the muscle fiber
2. Accumulation of substances (metabolites) within the muscle fiber, which interfere either with the release of calcium (Ca^{2+}) or with the ability of calcium to stimulate muscle contraction.

Substrates

Substrates within the muscle serve to power muscular contractions. They include molecules such as adenosine triphosphate (ATP), glycogen and creatine phosphate. ATP binds to the myosin head and causes the 'ratchetting' that results in contraction according to the sliding filament model. Creatine phosphate stores energy so ATP can be rapidly regenerated within the muscle cells from adenosine diphosphate (ADP) and inorganic phosphate ions, allowing for sustained powerful contractions that last between 5–7 seconds. Glycogen is the intramuscular storage form of glucose, used to generate energy quickly once intramuscular creatine stores are exhausted, producing lactic acid as a metabolic byproduct.

Substrate shortage is one of the causes of metabolic fatigue. Substrates are depleted during exercise, resulting in a lack of intracellular energy sources to fuel contractions. In essence, the muscle stops contracting because it lacks the energy to do so.

Metabolites

Metabolites are the substances (generally waste products) produced as a result of muscular contraction. They include chloride, potassium, lactic acid, ADP, magnesium (Mg^{2+}), reactive oxygen species, and inorganic phosphate. Accumulation of metabolites can directly or indirectly produce metabolic fatigue within muscle fibers through interference with the release of calcium (Ca^{2+}) from the sarcoplasmic reticulum or reduction of the sensitivity of contractile molecules actin and myosin to calcium.

Chloride

Intracellular chloride partially inhibits the contraction of muscles. Namely, it prevents muscles from contracting due to "false alarms", small stimuli which may cause them to contract (akin to myoclonus). This natural brake helps muscles respond solely to the conscious control or spinal reflexes[*citation needed*] but also has the effect of reducing the force of conscious contractions.

Potassium

High concentrations of potassium (K^+) also causes the muscle cells to decrease in efficiency, causing cramping and fatigue. Potassium builds up in the t-tubule system and around the muscle fiber as a result of action potentials. The shift in K^+ changes the membrane potential around the muscle fiber. The change in membrane potential causes a decrease in the release of calcium (Ca^{2+}) from the sarcoplasmic reticulum.[1]

Lactic acid

It was once believed that lactic acid build-up was the cause of muscle fatigue.[2] The assumption was lactic acid had a "pickling" effect on muscles, inhibiting their ability to contract. The impact of lactic acid on performance is now uncertain, it may assist or hinder muscle fatigue.

Produced as a by-product of fermentation, lactic acid can increase intracellular acidity of muscles. This can lower the sensitivity of contractile apparatus to Ca^{2+} but also has the effect of increasing cytoplasmic Ca^{2+} concentration through an inhibition of the chemical pump that actively transports calcium out of the cell. This counters inhibiting effects of potassium on muscular action potentials. Lactic acid also has a negating effect on the chloride ions in the muscles, reducing their inhibition of contraction and leaving potassium ions as the only restricting influence on muscle contractions, though the effects of potassium are much less than if there were no lactic acid to remove the chloride ions. Ultimately, it is uncertain if lactic acid reduces fatigue through increased intracellular calcium or increases fatigue through reduced sensitivity of contractile proteins to Ca^{2+}.

Lactic acid is now used as a measure of endurance training effectiveness and VO2 max.[3]

Pathology

Muscle weakness may be due to problems with the nerve supply, neuromuscular disease (such as myasthenia gravis) or problems with muscle itself. The latter category includes polymyositis and other muscle disorders.

Molecular mechanisms

Muscle fatigue may be due to precise molecular changes that occur *in vivo* with sustained exercise. It has been found that the ryanodine receptor present in skeletal muscle undergoes a conformational change during exercise, resulting in "leaky" channels that are deficient in calcium release. These "leaky" channels may be a contributor to muscle fatigue and decreased exercise capacity.[4]

Effect on performance

Fatigue has been found to play a big role in limiting performance in just about every individual in every sport. In research studies, participants were found to show reduced voluntary force production in fatigued muscles (measured with concentric, eccentric, and isometric contractions), vertical jump heights, other field tests of lower body power, reduced throwing velocities, reduced kicking power and velocity, less accuracy in throwing and shooting activities, endurance capacity, anaerobic capacity, anaerobic power, mental concentration, and many other performance parameters when sport specific skills are examined.[5][6][7][8][9][10]

Electromyography

Electromyography is a research technique that allows researchers to look at muscle recruitment in various conditions, by quantifying electrical signals sent to muscle fibers through motor neurons. In general, fatigue protocols have shown increases in EMG data over the course of a fatiguing protocol, but reduced recruitment of muscle fibers in tests of power in fatigued individuals. In most studies, this increase in recruitment during exercise correlated with a decrease in performance (as would be expected in a fatiguing individual).[11][12][13][14]

Median power frequency is often used as a way to track fatigue using EMG. Using the median power frequency, raw EMG data is filtered to reduce noise and then relevant time windows are Fourier Transformed. In the case of fatigue in a 30-second isometric contraction, the first window may be the first second, the second window might be at second 15, and the third window could be the last second of contraction (at second 30). Each window of data is analyzed and the median power frequency is found. Generally, the median power frequency decreases over time, demonstrating fatigue. Some reasons why fatigue is found are due to action potentials of motor units having a similar pattern of repolarization, fast motor units activating and then quickly deactivating while slower motor units remain, and conduction velocities of the nervous system decreasing over time.[15][16][17][18]

Yorum

- Yorgunluk iki temel boyut ile oluşmaktadır; a) nörolojik iletim, sinyalde azalma, b) metabolik açıdan, adalenin yorulması ile oluşan.
- Kasılmasını sağlayanlar; a) ATP, b)
- Kasılmasını engelleyenler;
    - 1) Klorür; hücre içindeki klorür, uyarılmayı engeller,
    - 2) Potasyum; kalsiyum kasılma, potasyum gevşeme işlemi ötesinde hücresel uyaran ve membran uyarılması azaltır,

- 3) Laktik asit; yorgunluk, ağrı ve adalede sertlik gözlenmektedir,
- 4) ADP; depo eklinde ve oksijen ile elektron transferi ile oluşmaktadır. Devamlı oluşan ve kullanılan mekanizması vardır. ATP, adenozinin Trifosfat enerji verir, ADP, adenozin difosfat ve AMP, adenozin monofosfat şeklinde 3'lü enerji sağlar ve yeniden yapılanarak, enerji alarak ATP olur ve birikir, yeter ki mitokondriler çalışışsın, onlar da enerji ve oksijen ile çalışırlar.
- 5) Magnezyum; hücrelerde elektrostatik uyaran olan Kalsiyum, hücre içinde de Magnezyumdur. Bu açıdan hücre içinden dışarı çıkma, K iyonunda da olduğu gibi yorgunluk boyutu, etkisizlik boyutudur.
- 6) Reaktif oksijen radikalleri; oksijen kullanılması veya bunları hiperoksi olması ile dokuya ters etkileşim olabilir, dengelenmesi önemlidir.
- 7) İnorganik fosfat; ATP yıkımı ile oluşan fosfor, yine dengelenmelidir, kalsiyum, P, magnezyum dengelenmelidir.
- 8) Bu maddeler kalsiyum salınması ile aktin ve myozinin kantraktil Sensitivite azalmaktadır.

Adale yorgunluğu hem nörolojik hem de metabolik olarak etkileşim olmaktadır. Nörolojik olarak fazla yorgun olan adalenin titremesi sık gözlenmektedir.

3) Lactic acid

Lactic acid is an organic compound with the formula $CH_3CH(OH)COOH$. In its solid state, it is white and water-soluble. In its liquid state, it is colorless. It is produced both naturally and synthetically. With a hydroxyl group adjacent to the carboxyl group, lactic acid is classified as an alpha-hydroxy acid (AHA). In the form of its conjugate base called lactate, it plays a role in several biochemical processes.

Exercise and lactate

During power exercises such as sprinting, when the rate of demand for energy is high, glucose is broken down and oxidized to pyruvate, and lactate is then produced from the pyruvate faster than the body can process it, causing lactate concentrations to rise. The production of lactate is beneficial for NAD^+ regeneration (pyruvate is reduced to lactate while NADH is oxidized to NAD^+), which is used up in oxidation of glyceraldehyde 3-phosphate during production of pyruvate from glucose, and this ensures that energy production is maintained and exercise can continue. (During intense exercise, the respiratory chain cannot keep up with the amount of hydrogen atoms that join to form NADH, and cannot regenerate NAD^+ quickly enough.)

The resulting lactate can be used in two ways:

- Oxidation back to pyruvate by well-oxygenated muscle cells, heart cells, and brain cells
  - Pyruvate is then directly used to fuel the Krebs cycle
- Conversion to glucose via gluconeogenesis in the liver and release back into circulation; see Cori cycle[18]
  - If blood glucose concentrations are high, the glucose can be used to build up the liver's glycogen stores.

However, lactate is continually formed even at rest and during moderate exercise. Some causes of this are metabolism in red blood cells that lack mitochondria, and limitations resulting from the enzyme activity that occurs in muscle fibers having a high glycolytic capacity.[18]

Yorum

Laktat bir oksijensiz enerji sağlarken, etkinlik %4 ve oksijenlenme ile %44 gibi fark söylenebilir. Akciğerlerin, adalelerin tam çalışması ile yeterli olması beklenilmemelidir.

Cori cycle (Wikipedia)

The **Cori cycle** (also known as the Lactic acid cycle), named after its discoverers, Carl Ferdinand Cori and Gerty Cori,[1] refers to the metabolic pathway in which lactate produced by anaerobic glycolysis in the muscles moves to the liver and is converted to glucose, which then returns to the muscles and is metabolized back to lactate.[2]

Significance

The cycle's importance is based on the prevention of lactic acidosis in the muscle under anaerobic conditions. However, normally before this happens the lactic acid is moved out of the muscles and into the liver.[3]

The cycle is also important in producing ATP, an energy source, during muscle activity. The Cori cycle functions more efficiently when muscle activity has ceased. This allows the oxygen debt to be repaid such that the Krebs cycle and electron transport chain can produce energy at peak efficiency.[3]

The Cori cycle is a much more important source of substrate for gluconeogenesis than food.[4][5] The contribution of Cori cycle lactate to overall glucose production increases with fasting duration.[6] Specifically, after 12, 20, and 40 hours of fasting by human volunteers, the contribution of Cori cycle lactate to gluconeogenesis is 41%, 71%, and 92%, respectively.[6]

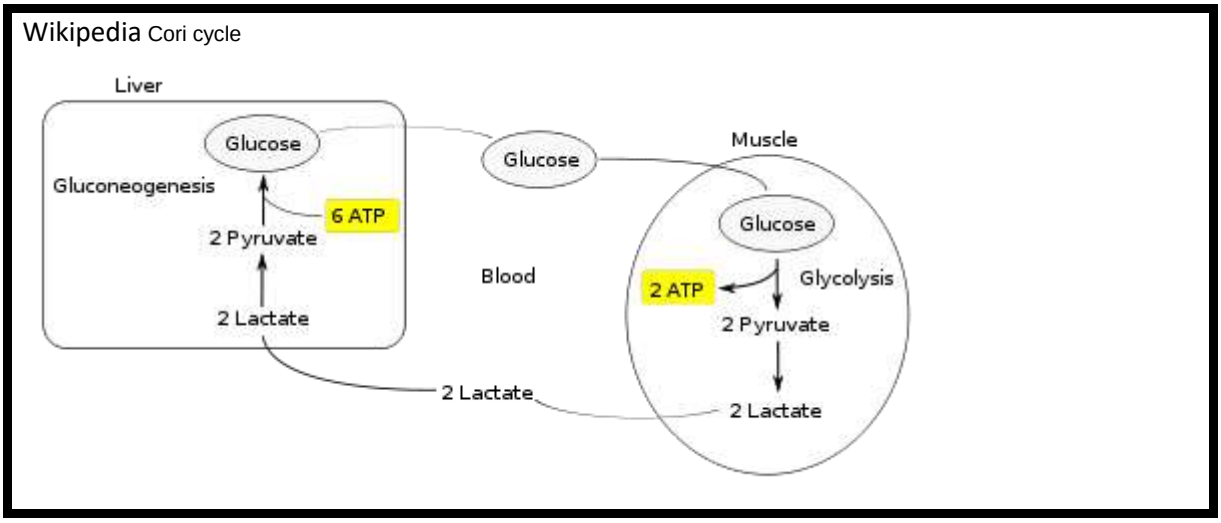
The drug metformin can cause lactic acidosis in patients with renal failure because metformin inhibits the hepatic gluconeogenesis of the Cori cycle, particularly the mitochondrial respiratory chain complex 1.[7] The buildup of lactate and its substrates for lactate production, pyruvate and alanine, lead to excess lactate.[8] Normally, the excess lactate would be cleared by the kidneys, but in patients with renal failure, the kidneys cannot handle the excess lactic acid.

Yorum

Oruç tutulması için, bedenin güçlü ve sağlıklı olması beklenir. Bunun gerekçesi; 12 saatlik açlıkta %41 laktik asit döngüsü etkin iken, 20 saatlik açlıkta %71 etkin olmaktadır. Dolayısıyla 4-6 saat açlıkta ağzımızın kokması da bundan olmaktadır. Ancak yeterince karaciğer çalışmaması, proteinden gelen yıkım nedeniyle renal solüt yükü fazlalığı ile de bayılma gözlenebilmektedir. Bu açıdan ölüm orucu tutanlar, 40-48 saat aç olacakları için, %92 oranında laktik asit döngüsünü sağlamayabilirler, o nedenle şekerli ve tuzlu su ile enerjileri sağlanmalıdır.

Adalelerin çalışması ile oluşan laktik asit, bir toksik madde gibi algılanmamalıdır, bunun yıkılması ve kullanılması gerekir. Pirüvik asite dönmesi ile asetil CoA ile Krebs döngüsünde yakılabilmekte, 34/2-16-17 ATP oluşumuna kadar etkisi de olabilmektedir. Çözüm temelde istirahattir.

Laktik asit metabolik döngüsü (Cori)



Şekil 2: a) Glikozun yapılanması/glukoneogenezis, iki adet laktik asit bütünleşmedi (6 ATP gerekir), b) glikozun yıkılması/glikoliz ile 2 adet laktat oluşmakta, 2 ATP oluşmaktadır.

4) Lactic acid fermentation (Wikipedia)

Lactic acid fermentation is a metabolic process by which glucose and other six-carbon sugars (also, disaccharides of six-carbon sugars, e.g. sucrose or lactose) are converted into cellular energy and the metabolite lactate. It is an anaerobic fermentation reaction that occurs in some bacteria and animal cells, such as muscle cells.[1][2][3]
If oxygen is present in the cell, many organisms will bypass fermentation and undergo cellular respiration; however, facultative anaerobic organisms will both ferment and undergo respiration in the presence of oxygen.[3] Sometimes even when oxygen is present and aerobic metabolism is happening in the mitochondria, if pyruvate is building up faster than it can be metabolized, the fermentation will happen anyway.
Lactate dehydrogenase catalyzes the interconversion of pyruvate and lactate with concomitant interconversion of NADH and NAD^+.
In *homolactic fermentation*, one molecule of glucose is ultimately converted to two molecules of lactic acid. *Heterolactic fermentation*, in contrast, yields carbon dioxide and ethanol in addition to lactic acid, in a process called the phosphoketolase pathway.[1]

Yorum

Laktik asit anaerobik fermantasyon sonucunda oluşmakta ve yoğurt, sirke, gibi birçok yemeklerin oluşmasında etkin olmaktadır. Oksijenlenme ile enerji döngüsüne girmekte ve karbondioksit ve enerji oluşmaktadır. Oksijensiz yol ile enerji sağlanmasıdır.

5) Acidosis (Wikipedia)

Lactic acidosis is a medical condition characterized by the buildup of lactate (especially L-lactate) in the body, which results in an excessively low pH in the bloodstream. It is a form of metabolic acidosis, in which excessive acid accumulates due to a problem with the body's metabolism of lactic acid.

Lactic acidosis is typically the result of an underlying acute or chronic medical condition, medication, or poisoning. The symptoms are generally attributable to these underlying causes, but may include nausea, vomiting, rapid deep breathing, and generalised weakness.
The diagnosis is made on biochemical analysis of blood (often initially on arterial blood gas samples), and once confirmed, generally prompts an investigation to establish the underlying cause to treat the acidosis. In some situations, hemofiltration (purification of the blood) is temporarily required. In rare chronic forms of lactic acidosis caused by mitochondrial disease, a specific diet or dichloroacetate may be used. The prognosis of lactic acidosis depends largely on the underlying cause; in some situations (such as severe infections), it indicates an increased risk of death.

Classification

The Cohen-Woods classification categorizes causes of lactic acidosis as:[1]

- Type A: Decreased tissue oxygenation (e.g., from decreased blood flow)
- Type B
  - B1: Underlying diseases (sometimes causing type A)
  - B2: Medication or intoxication
  - B3: Inborn error of metabolism

Yorum

Adalelerin çalışması ve yeterli oksijenin gelmemesi ile beyin bunları algılamaz ise, olay bayılana kadar sürebilir. Akciğerler her bireyde farklı olmasına karşın, yetersiz olmaktadır. Bunun yanında yangın dumanı, karbondioksit veya karbon monoksit akciğerle alınması ile ölümü kolaylaştırıcı etki olarak akciğerler devreye girmektedir. Genel boyut olarak, eğer bir kişi 2 dakika suyun altında kalabiliyorsa, başkasına yardım için eğitilmelidir. 4 dakika su içinde kalabiliyorsa, o zaman dalıcı, yüzücü olabilir. Aynı durum koşma boyuna göre, ne kadar mesafeyi kaç dakikada geçiyor ve kalp atımı ile adale krampı bakılması ile atlet derecesine sokulabilir. Yarışmaya girebilmesi için ise, laktik asit metabolik gücü önemlidir.

6) Aerobic exercise

Aerobic exercise (also known as **cardio**) is physical exercise of low to high intensity that depends primarily on the aerobic energy-generating process.[1] Aerobic literally means "relating to, involving, or requiring free oxygen",[2] and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism.[3] Generally, light-to-moderate intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods of time.[1]
When practiced in this way, examples of cardiovascular/aerobic exercise are medium to long distance running/jogging, swimming, cycling, and walking, according to the first extensive research on aerobic exercise, conducted in the 1960s on over 5,000 U.S. Air Force personnel by Dr. Kenneth H. Cooper.[4][5]

Aerobic versus anaerobic exercise

…
In almost all conditions, anaerobic exercise is accompanied by aerobic exercises because the less efficient anaerobic metabolism must supplement the aerobic system due to energy demands that exceed the aerobic system's capacity. What is generally called aerobic exercise might be better termed "solely aerobic", because it is designed to be low-intensity enough not to generate lactate via pyruvate fermentation, so that all carbohydrate is aerobically turned into energy.
…
As glycogen levels in the muscle begin to fall, glucose is released into the bloodstream by the liver, and fat metabolism is increased so that it can fuel the aerobic pathways. Aerobic exercise may be fueled by glycogen reserves, fat reserves, or a combination of both, depending on the intensity. Prolonged moderate-level aerobic exercise at 65% VO2 max (the heart rate of 150 bpm for a 30-year-old human) results in the maximum contribution of fat to the total energy expenditure. At this level, fat may contribute 40% to 60% of total, depending on the duration of the exercise. Vigorous exercise above 75% VO2max (160 bpm) primarily burns glycogen.[8][9]
Major muscles in a rested, untrained human typically contain enough energy for about 2 hours of vigorous exercise. Exhaustion of glycogen is a major cause of what marathon runners call "hitting the wall". Training, lower intensity levels, and carbohydrate loading may allow postponement of the onset of exhaustion beyond 4 hours.[9]

Benefits

Among the recognized benefits of doing regular aerobic exercise are:[10]

- Strengthening the muscles involved in respiration, to facilitate the flow of air in and out of the lungs
- Strengthening and enlarging the heart muscle, to improve its pumping efficiency and reduce the resting heart rate, known as aerobic conditioning
- Improving circulation efficiency and reducing blood pressure
- Increasing the total number of red blood cells in the body, facilitating transport of oxygen
- Improved mental health, including reducing stress and lowering the incidence of depression, as well as increased cognitive capacity.[11]
- Reducing the risk for diabetes. One meta-analysis has shown, from multiple conducted studies, that aerobic exercise does help lower Hb A_{1C} levels for type 2 diabetics.[12]

As a result, aerobic exercise can reduce the risk of death due to cardiovascular problems. In addition, high-impact aerobic activities (such as jogging or using a skipping rope) can stimulate bone growth, as well as reduce the risk of osteoporosis for both men and women.
In addition to the health benefits of aerobic exercise, there are numerous performance benefits:

- Increased storage of energy molecules such as fats and carbohydrates within the muscles, allowing for increased endurance
- Neovascularization of the muscle sarcomeres to increase blood flow through the muscles

- Increasing speed at which aerobic metabolism is activated within muscles, allowing a greater portion of energy for intense exercise to be generated aerobically
- Improving the ability of muscles to use fats during exercise, preserving intramuscular glycogen
- Enhancing the speed at which muscles recover from high intensity exercise
- Neurobiological effects: improvements in brain structural connections and increased gray matter density, new neuron growth, improved cognitive function (cognitive control and various forms of memory), and improvement or maintenance of mental health

Some drawbacks of aerobic exercise include:

- Overuse injuries because of repetitive, high-impact exercise such as distance running.
- Is not an effective approach to building muscle.
- Only effective for fat loss when used consistently.

Both the health benefits and the performance benefits, or "training effect", require a minimum duration and frequency of exercise. Most authorities suggest at least twenty minutes performed at least three times per week.[13]
Cooper himself defines aerobic exercise as the ability to utilise the maximum amount of oxygen during exhaustive work. Cooper describes some of the major health benefits of aerobic exercise, such as gaining more efficient lungs by maximising breathing capacity, thereby increasing ability to ventilate more air in a shorter period of time. As breathing capacity increases, one is able to extract oxygen more quickly into the blood stream, increasing elimination of carbon dioxide. With aerobic exercise the heart becomes more efficient at functioning, and blood volume, hemoglobin and red blood cells increase, enhancing the ability of the body to transport oxygen from the lungs into the blood and muscles. Metabolism will change and enable consumption of more calories without putting on weight. Aerobic exercise can delay osteoporosis as there is an increase in muscle mass, a loss of fat and an increase in bone density. With these variables increasing, there is a decrease in likelihood of diabetes as muscles use sugars better than fat. One of the major benefits of aerobic exercise is that body weight may decrease slowly; it will only decrease at a rapid pace if there is a calorie restriction, therefore reducing obesity rates.[14]

Yorum

Adalelerin enerji kullanması için, özellikle yağların yakılması ve sağlık açısından istenilen boyuta gelmesi istenir. Bunun anlamı aerobik egzersiz yapmaktır. Kısaca 150 dakika kalp atımı ile 30 yaşındaki bir insan, %65 oran ile, yağ yakılmasında %40-60 etkin olmaktadır. Ancak daha zorlama ile 160 kalp atımı ile daha fazla zorlama yapılırsa glikojen de yakılmakta ve yorgunluk oluşabilmektedir. 2 saat sonra dinlenme gerekirken, daha düşük ve eğitilmiş olunması ile 4 saatlik bir aktif spor yapmak olanaklıdır.

Faydaları;

- Spor ile akciğerin etkinliği daha fazla oluşturulabilmektedir.
- Kalbin gücü, output etkinliği de arttırabilmektedir.
- Dolaşım daha verimli olup, kan basıncı da azalmaktadır.
- Hemoglobin ve oksijen taşıma artmaktadır.
- Stresi yatıştırması ile akıl sağlığı düzgünleşmektedir
- Diyabet riski de azalmaktadır.
- Performansta da düzelme sağlamaktadır
    - Yeniden damarlanma ile kanlanma olasılığı arttırılabilir
    - Adalede enerji korunması ile adalenin güçlenmesini oluşturur
    - Büyük enerjinin oluşmasını, aerobik egzersiz ile sağlayabilmektedir.
    - Adalede yağ yakmasını arttırarak glikojeni korumayı sağlar
    - Beyinde bilinç düzeyinde gelişimi sağlayabilmektedir.
    - Yüksek egzersiz yapılanlarda adale iyileşmesi daha kolay olmaktadır
- Zararlı olabilme olasılığı da mevcuttur
    - Fazla spor ile zedelenme oluşturulabilmektedir.
    - Adale yapmak için spor ve bedenin zorlanması iyi bir yöntem değildir
    - Yağ yakılması için devamlı ve zorlamadan yapılması gereklidir.

Spor ile kilo vermenin devamlı ama kontrollü olması gerekir. Bir insanın adale yapması için değil, spor sağlıklı olması için yapılmalıdır. Tercihan de aerobik spor yapılmalıdır.

7) Aerobic capacity

Aerobic capacity describes the functional capacity of the cardiorespiratory system, (the heart, lungs and blood vessels). Aerobic capacity refers to the maximum amount of oxygen consumed by the body during intense exercises, in a given time frame.[15] It is a function both of cardiorespiratory performance and the maximum ability to remove and utilize oxygen from circulating blood. To

measure maximal aerobic capacity, an exercise physiologist or physician will perform a VO_2 max test, in which a subject will undergo progressively more strenuous exercise on a treadmill, from an easy walk through to exhaustion. The individual is typically connected to a respirometer to measure oxygen consumption, and the speed is increased incrementally over a fixed duration of time. The higher the measured cardiorespiratory endurance level, the more oxygen has been transported to and used by exercising muscles, and the higher the level of intensity at which the individual can exercise. More simply put, the higher the aerobic capacity, the higher the level of aerobic fitness. The Cooper and multi-stage fitness tests can also be used to assess functional aerobic capacity for particular jobs or activities.
The degree to which aerobic capacity can be improved by exercise varies very widely in the human population: while the average response to training is an approximately 17% increase in VO_2max, in any population there are "high responders" who may as much as double their capacity, and "low responders" who will see little or no benefit from training.[16] Studies indicate that approximately 10% of otherwise healthy individuals cannot improve their aerobic capacity with exercise at all.[17] The degree of an individual's responsiveness is highly heritable, suggesting that this trait is genetically determined.[16]

Aerobic exercise and obesity

Obesity in Australia is becoming a huge issue, with one in four Australians being overweight. Obesity can be deadly as it increases the risk of coronary heart disease, type 2 diabetes and stroke. In Australia it is proven that nearly 40% of males and 60% of females do not do enough physical activity a day. Introducing aerobic exercise to a daily routine would benefit the body and reduce the risk of cardiovascular disease. The Australian Heart Foundation guidelines outline that exercise to reduce fat should involve continuous moderate aerobic exercise. Continuous moderate exercise is easily accessible and should be performed for at least 30 minutes five times a week. This will reduce obesity by 19% versus no activity at all.[18]

Alternatives

Higher intensity exercise, such as High-intensity interval training (HIIT), increases the resting metabolic rate (RMR) in the 24 hours following high intensity exercise,[19] ultimately burning more calories than lower intensity exercise; low intensity exercise burns more calories during the exercise, due to the increased duration, but fewer afterwards.

Commercial success

Aerobic exercise has long been a popular approach to achieving weight loss and physical fitness, often taking a commercial form.

- In the 1970s Judi Sheppard Missett helped create the market for commercial aerobics with her Jazzercise program
- In the 1980s Richard Simmons hosted an aerobic exercise show on television, and also released a series of exercise videos
- In the 1990s Billy Blanks's Tae Bo helped popularize cardio-boxing workouts that incorporated martial arts movements

Varieties

Yorum

30 dakikalık haftada 5 defa devamlı spor yapılması, obesiteyi, %19 oranında azalttığı saptanmıştır. Spor yaklaşımlarında farklı uygulamalar olmakta, bunların raporları ve etkileşimleri belirtilmektedir.

Başlıca aerobik spor etkinlikleri:

Indoor/ev içinde

- Stair climbing/merdiven tırmanma, Elliptical trainer/elips dairesel boyut, Indoor rower/kürek çekme, Stairmaster/merdiven çıkma, Stationary bicycle/sabir bisiklet, Treadmill/yürüme, Aerobic gymnastics/aerobik jimnastik aleti

Outdoor/dış dünyada

- Walking/yürüme, Cycling/bisklete binme, Running/koşma, Cross-country skiing/kayak ile yürüme, Cross-country running/tepelerde koşma, Nordic walking/tırmanma, Inline skating/kayak, Rowing/kürek çekme

Indoor or outdoor/iç ve dış spor etkinlikleri

- Swimming/yüzme, Kickboxing/ayakla vurarak boks yapma, Skipping rope or jump rope/ip ile atlama, zıplama, Circuit training/halka eğitimi, Jumping jacks/zıplama, Water aerobics/su aerobikleri, Jogging/yolda koşma

NOT: Zorlama ile olması durumunda, anaerobik spor olur, bu açıdan dikkat edilmelidir.

8) Anaerobic exercise

Anaerobic exercise is a physical exercise intense enough to cause lactate to form. It is used by athletes in non-endurance sports to promote strength, speed and power and by body builders to build muscle mass. Muscle energy systems trained using anaerobic exercise develop differently compared to aerobic exercise, leading to greater performance in short duration, high intensity activities, which last from mere seconds to up to about 2 minutes.[1] Any activity lasting longer than about two minutes has a large aerobic metabolic component.[*citation needed*]

Metabolism

...

The two types of anaerobic energy systems are: 1) high energy phosphates, adenosine triphosphate and creatine phosphate; and 2) anaerobic glycolysis. The former is called *alactic anaerobic* and the latter *lactic anaerobic* system.[5] High energy phosphates are stored in limited quantities within muscle cells. Anaerobic glycolysis exclusively uses glucose (and glycogen) as a fuel in the absence of oxygen, or more specifically when ATP is needed at rates that exceed those provided by aerobic metabolism. The consequence of such rapid glucose breakdown is the formation of lactic acid (or more appropriately, its conjugate base lactate at biological pH levels). Physical activities that last up to about thirty seconds rely primarily on the former, ATP-CP phosphagen system. Beyond this time both aerobic and anaerobic glycolysis-based metabolic systems begin to predominate.
The by-product of anaerobic glycolysis, lactate, has traditionally been thought to be detrimental to muscle function.[6] However, this appears likely only when lactate levels are very high. Elevated lactate levels are only one of many changes that occur within and around muscle cells during intense exercise that can lead to fatigue. Fatigue, that is muscle failure, is a complex subject. Elevated muscle and blood lactate concentrations are a natural consequence of any physical exertion. The effectiveness of anaerobic activity can be improved through training.[7]

Yorum

Adalelerin anaerobik sistem ile enerji temini; a) ATP, kreatinin fosfat ile elde edilmesi ile, b) glikoliz yolu ile sağlanmaktadır. Bunlar kısa süreli olup, adalede ağrı, kramp ve yorgunluk oluşturmaktadır.

9) Creatine kinase

phospho-creatine kinase—is an enzyme (EC 2.7.3.2) expressed by various tissues and cell types. CK catalyses the conversion of creatine and utilizes adenosine triphosphate (ATP) to create phosphocreatine (PCr) and adenosine diphosphate (ADP). This CK enzyme reaction is reversible and thus ATP can be generated from PCr and ADP.
In tissues and cells that consume ATP rapidly, especially skeletal muscle, but also brain, photoreceptor cells of the retina, hair cells of the inner ear, spermatozoa and smooth muscle, PCr serves as an energy reservoir for the rapid buffering and regeneration of ATP *in situ*, as well as for intracellular energy transport by the PCr shuttle or circuit.[2] Thus creatine kinase is an important enzyme in such tissues.[3]
Clinically, creatine kinase is assayed in blood tests as a marker of damage of CK-rich tissue such as in myocardial infarction (heart attack), rhabdomyolysis (severe muscle breakdown), muscular dystrophy, autoimmune myositides, and acute kidney injury.[4]

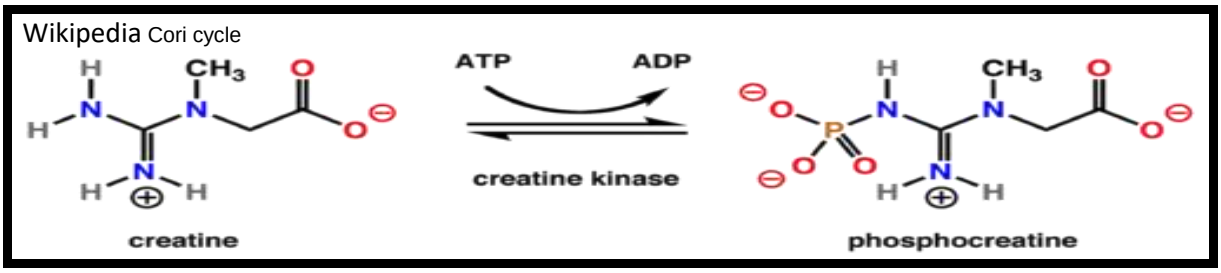
Functions

The mitochondrial creatine kinase (CK_m) is present in the mitochondrial intermembrane space, where it regenerates phosphocreatine (PCr) from mitochondrially generated ATP and creatine (Cr) imported from the cytosol. Apart from the two mitochondrial CK isoenzyme forms, that is, ubiquitous mtCK (present in non-muscle tissues) and sarcomeric mtCK (present in sarcomeric muscle), there are three cytosolic CK isoforms present in the cytosol, depending on the tissue. Whereas MM-CK is expressed in sarcomeric muscle, that is, skeletal and cardiac muscle, MB-CK is expressed in cardiac muscle, and BB-CK is expressed in smooth muscle and in most non-muscle tissues. Mitochondrial mtCK and cytosolic CK are connected in a so-called PCr/Cr-shuttle or circuit. PCr generated by mtCK in mitochondria is shuttled to cytosolic CK that is coupled to ATP-dependent processes, e.g. ATPases, such as acto-myosin ATPase and calcium ATPase involved in muscle contraction, and sodium/potassium ATPase involved in sodium retention in the kidney. The bound cytosolic CK accepts the PCr shuttled through the cell and uses ADP to regenerate ATP, which can then be used as energy source by the ATPases (CK is associated intimately with the ATPases, forming a functionally coupled microcompartment). PCr is not only an energy buffer but also a cellular transport form of energy between subcellular sites of energy (ATP) production (mitochondria and glycolysis) and those of energy utilization (ATPases).[2] Thus, CK enhances skeletal, cardiac, and smooth muscle contractility, and is involved in the generation of blood pressure.[6]

Yorum

Adalelerin enerji temini konusunda fosfo-kreatinin den kreatinin oluşması ile ATP oluşmaktadır. Bu adaleler için önemli bir ATP kaynağı oluşturmaktadır.

Kreatin kinaz ve ATP



Şekil 3 Kreatininden fosfokreatinin oluşması ile adalede ATP deposundan söz edilebilir.

10) Personal trainer

A **personal trainer** is an individual certified to have a varying degree of knowledge of general fitness involved in exercise prescription and instruction. They motivate clients by setting goals and providing feedback and accountability to clients. Trainers also measure their client's strengths and weaknesses with fitness assessments. These fitness assessments may also be performed before and after an exercise program to measure their client's improvements in physical fitness. They may also educate their clients in many other aspects of wellness besides exercise, including general health and nutrition guidelines.
Qualified personal trainers recognize their own areas of expertise. If a trainer suspects that one of his or her clients has a medical condition that could prevent the client from safe participation in an exercise program, they must refer the client to the proper health professional for prior clearance.[1]

Purpose of personal training

Personal trainer assessing a client's goals and needs as they write a fitness program
The scope of practice for a personal trainer is to enhance the components of fitness for the general, healthy population.
Proper exercise prescription may result in improved body composition, physical performance, heart condition and health outcomes.[2] The decision to hire a trainer may be related to a perceived ability to facilitate these factors through proper prescription and instruction or factors related to motivation and adherence. A trainer pays close attention to their client's exercise form, workout routine, and nutrition plan.
Few studies have investigated training for men, however, training in women has been shown to exercise behavior patterns, improve perceptual benefit-to-concern ratio for exercise (decisional balance), and increase confidence to choose exercise in the face of other time demands (scheduling self-efficacy).[3] Personal training results in higher strength, higher workout intensities,

and higher perceived exertion during exercise in women. Although women working with personal trainers do self-select heavier loads than women who did not, the loads used are still below recommended training load percentages.[4]

Employment characteristics

The profession is generally not restricted by venue, and personal trainers may work in fitness facilities, in their personal homes, in client homes, over live video (also called "virtual personal trainers"),[5] or outdoors. Almost all personal trainers and group exercise instructors work in physical fitness facilities, health clubs, and fitness centers located in the amusement and recreation industry or in civic and social organizations.[6] Personal training is not regulated in any jurisdiction in the United States except for Washington D.C. which adopted registration requirements for personal fitness trainers in February 2014.[7]

Personal trainers may specialize in a certain training type, training philosophy, performance type, exercise modality, or client population. In general, most personal trainers develop exercise prescription plans for aerobic exercise, resistance exercise, and/or flexibility training. With aerobic exercise prescription, personal trainers determine the type of exercise, duration of exercise, and frequency of exercise. For resistance exercise prescription, the type of exercise, total session volume, rest period, frequency, and intensity are determined.[8] Personal trainers may also be involved in prescription of stretching routines or other approaches. While some discuss nutrition, ergogenic supplementation, and spiritual practices with clients, there is debate within the industry as to whether it fits within their scope of practice and training qualifications.[9]

Accreditation

Personal trainer accreditation is a process that provides certification of competency as a personal trainer. Qualification standards for personal trainers vary between countries.

Yorum

Bireye göre genel sağlık veya adalelerin geliştirilmesi boyutu için bireysel çaba gerekir. Bu şekilde her ferde gereksinimi kadar yeterli ve dengeli yaklaşım yapılmalıdır. Hekimlikte bu işlev için Ortopedi, Fizik Tedavi Hekimlik Uzmanlığı kadar, fizyoterapist ve hastalık veya özre göre ortopedik cihaz oluşturulmalıdır. Bir el bilek zedelenmesi gibi, sorunların oluşmasında da fizik tedavi yaklaşımı, önemli bir boyut getirmekte, daha hızlı iyileşme ve sağlıklı olmayı temin etmektedir.

11) Canada Fitness Award Program

The **Canada Fitness Award Program** was a national fitness test and evaluation program operated by the Government of Canada department Health and Welfare Canada from 1970 to 1992.[1] It was a successor to the Centennial Athletic Awards Program,[2] and was replaced by the Active Living Challenge program.[3]

Millions of primary and secondary school children participated in the program.[4] It was discontinued in part because it discouraged those it was intended to motivate.

Establishment

The program was developed by Sport and Recreation Canada,[5] a division of Health and Welfare Canada. It was established as a national fitness program by the Government of Canada, and began operating in September 1970.[6] An official program launch ceremony was held in Lansdowne Park in Ottawa on 21 October 1970.[2]

The program had several objectives:[7][5]

- to promote health and fitness in Canadian youth
- to encourage youth to achieve higher levels of fitness
- to provide an "opportunity to participate in a continuing award plan"
- to recognize physical fitness achievements
- to increase public awareness of sports and recreation

It was intended to "create better attitudes towards personal fitness" and to build skills and aptitudes useful "beyond the formative years".[8]

Standards

The program defined national standards for four performance levels (Excellence, Gold, Silver, and Bronze) by age, sex, and activity, for participants from 6 to 17 years old.[15][19] The standards were updated in the 1980 program revision.[15]

For example, the standards for the endurance run established in the 1979 revision for the program were:[20]

Endurance run, time by age and sex

Level	1,600 m	2,400 m					
	12	13	14	15	16	17	18
Females							
Excellence	8:41	13:54	13:28	13:31	12:38	12:45	12:45
Gold	9:18	14:33	14:18	14:01	13:22	13:31	13:31
Silver	10:26	16:12	15:51	16:02	16:44	15:19	15:19
Bronze	12:46	18:59	18:51	18:58	18:37	18:53	18:53
Males							
Excellence	7:41	11:31	10:43	10:23	10:08	10:08	10:08
Gold	8:04	11:49	11:09	10:50	10:42	10:32	10:32
Silver	8:46	12:51	12:16	11:51	11:22	11:10	11:10
Bronze	10:31	15:35	14:40	14:46	14:08	13:33	13:33

Awards

All students received a participation pin or certificate for participating in the test.[21][22][23]

Yorum

Yukarıda belirtildiği gibi, üst limitler tanımlanmış ve bunlara ulaşılması ile madalya önerilmesi yapılmaktadır.

Kişisel spor ve bedensel aktivitedeki hedeflenen amaçlar;

- Özellikle büyüme ve gelişme çağındaki gençlerde sağlık ve sıhhatli olmayı sağlamak
- Gençlerin daha üst düzeyde bedensel iyilik halinin olması, oluşması
- Daha üst düzeyde atlet ve ödül alabilecek boyuta çıkmaları
- Fiziksel sıhhatli olmayı bilmeleri ve öğrenmeleri, kısaca yapmaları
- Toplumda spor ve yeniden farkındalık açısının arttırılması

12) Fitness professional

A **fitness professional** is a professional in the field of fitness and exercise, most often instruction (**fitness instructor**), including aerobics and yoga instructors and authors of fitness instruction books or manuals. Fitness topics may also include nutrition, weight-loss, and self-help. Fitness careers are distinguished from exercise science careers such as athletic training, however the various types of fitness certifications[1] have more and more in common: the, "distinctions...have become blurred, with more similarities than differences given the common background that all fitness professionals must possess."[2]
Fitness professionals screen participants for exercise programs, evaluate various fitness components, prescribe exercise to improve these components, and may also help people with specific or chronic conditions.[2]
Notable fitness professionals or former fitness professionals include Richard Simmons, Susan Powter, John Sitaras and Gov. Arnold Schwarzenegger (*Arnold Schwarzenegger's Total Body Workout*).
Certified fitness professionals must maintain up-to-date on all certifications in order to instruct at particular health clubs and gyms. Often, fitness professionals will have some education in kinesiology, anatomy, and biomechanics to aid in their fitness career.
In Canada, Canadian Fitness Education Services (CFES) provides national fitness leadership program modules to take candidates through the steps in Aquafit, Group Fitness and/or Weight Training Instructor and Personal Trainer national certification.
Personal training, Athletic training, and physical therapy are all technically distinct specialties with different processes and requirements for certification.[3] In the United States the main certifying agency for personal trainers is ACSM (the American College of Sports Medicine),[4] while the main certifying agency for athletic trainers is NATA (the National Athletic Trainers' Association). Obtaining certification or licensure as a physical therapist requires that you attend and graduate from a masters or doctoral program in physical therapy.[5]

Yorum

Her sporcunun belirli düzeye çıkabilmesi için antrenör yetiştirilmeli ve bunlar sayesinde Koçluk veya Mentorluk ile başarı peşinde koşulmalıdır.

13) Physical exercise

Yorum

Fizik egzersizlerin vücudumuzda yaptıkları etkileri şekil 4'de sunulmaktadır.

Spor yapmanın çeşitli etkileşimi

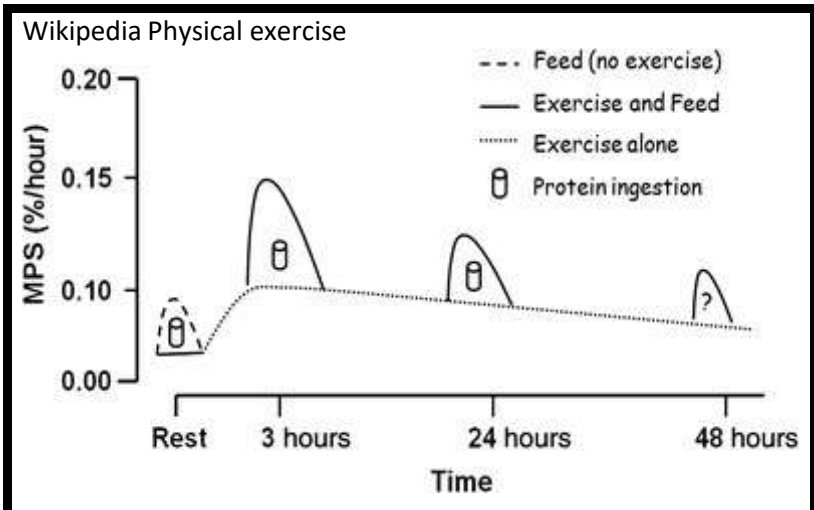
Wikipedia Physical exercise

Type of adaptation/Adaptasyon profili	**Endurance/Dayanıklılık training effects**	**Strength/Adale gücü training effects**
Skeletal muscle morphology and exercise performance adaptations/adale ve egzersiz durumu		
Muscle hypertrophy/adale gelişmesi	**↔(+/-)**	**↑ ↑ ↑(+++)**
Muscle strength and power/adale gücü	**↔ ↓(+/-, -)**	**↑ ↑ ↑(+++)**
Muscle fiber size/adalenin lifi	**↔ ↑(+/-, +)**	**↑ ↑ ↑(+++)**
Myofibrillar protein synthesis/protein sentezi	**↔ ↑(+/-, +)**	**↑ ↑ ↑(+++)**
Neuromuscular adaptations/sinir ve adale uyumu	**↔ ↑(+/-, +)**	**↑ ↑ ↑(+++)**
Anaerobic capacity/aerobic kapasitesi	**↑ (+)**	**↑ ↑(++)**
Lactate tolerance/laktat toleransı	**↑ ↑(++)**	**↔ ↑(+/-, +)**
Endurance capacity/dayanıklılık kapasitesi	**↑ ↑ ↑(+++)**	**↔ ↑(+/-, +)**
Capillary growth (angiogenesis)/damarlanma artışı	**↑ ↑(++)**	**↔(+/-)**
Mitochondrial biogenesis/mitokondri kapasitesi	**↑ ↑(++)**	**↔ ↑(+/-, +)**
Mitochondrial density and oxidative function/oksidasyon	**↑ ↑ ↑(+++)**	**↔ ↑(+/-, +)**

Whole-body and metabolic adaptations/tüm vücut metabolik adaptasyonu		
Bone mineral density/kemik minerl dansitesi	↑↑(++)	↑↑(++)
Inflammatory markers/inflamasyon simgeleri	↓↓(- -)	↓
Flexibility/esneklik	↑(+)	↑
Posture/duruş	↔(+/-)	↑
Ability in activities of daily living/günlük yaşam aktivitesi	↔↑(+/-, +)	↑↑(++)
Basal metabolic rate/bazal metabolik aktivite	↑(+)	↑↑(++)
Body composition/Vücut kapsamlarındaki durum		
Percent body fat/Yağ oranı	↓↓(- -)	↓(-)
Lean body mass/cıblak vücut kitle indeksi	↔(+/-)	↑↑(++)
Glucose metabolism/Glükoz metabolizması		
Resting insulin levels/istirahat halinde açlık	↓(-)	↓(-)
Insulin sensitivity/insüline hassasiyet	↑↑(++)	↑↑(++)
Insulin response to glucose challenge/glükoza insulin cevabı	↓↓(- -)	↓↓(- -)
Cardiovascular adaptations/Kalp ve damar uyumu		
Resting heart rate/istirahat helinde kalp atımı	↓↓(- -)	↔(+/-)
Stroke volume (resting and maximal)/kalp basma gücü	↑↑(++)	↔(+/-)
Systolic blood pressure (resting)/sistolik kan basıncı	↔↓(+/-, -)	↔(+/-)
Diastolic blood pressure (resting)/diastolic kan basıncı	↔↓(+/-, -)	↔↓(+/-, -)
Cardiovascular risk profile/Risk profili	↓↓↓(- - -)	↓(-)

Tablo/Şekil 4: Sporun organizmadaki etkileri

Spor yapmak, direnç karşı adale gerilmesi ile Adale/Muscle Protein Sentezi (MPS)



Adalelerde protein sentezi oluşması

- **İstirahatte**
  Spor yapmadan alınan proteinin ancak %0,1 oranında katkı sağladığı belirtilmektedir.
  Protein dengeli ve yeterli olmalıdır
  Bitkisel proteinler yüksek olsa da Esansiyel aminoasitler olmalıdır
- **3 saatlik spor yapılması ile**
  En etkili protein yapımı bu süreçte
- **24 saatlik spor yapılması ile**
  Protein ile yapılanma olmalıdır
- **48 saatlik spor yapılması ile**
  Etkileşim düşük olmaktadır
  Gereksinime göre protein olmalı

Şekil 5: Spor ile protein yapılanmasında artış olması beklenir. Bunun daha önce yenilen protein değil, 3 saat sonraki olanda daha etkilidir.

Yorum

Adalelerin çalışmasının, spor yapmanın, bedeni zorlamadıkça, bedenden gelen yorgunluk, ağrı ve kramp boyutuna girmeden, devamlı ve belirli bir süreç içinde yaklaşım yapmanın faydaları belirgindir. Fazlasının oluşması da bireye göre değişmektedir.

14) Exercise trends

Worldwide there has been a large shift towards less physically demanding work.[148] This has been accompanied by increasing use of mechanized transportation, a greater prevalence of labor saving technology in the home, and fewer active recreational pursuits.[148] Personal lifestyle changes however can correct the lack of physical exercise.

Research in 2015 indicates integrating mindfulness to physical exercise interventions increases exercise adherence, self-efficacy and also has positive effects both psychologically and physiologically.[149]

Social and cultural variation

Exercising looks different in every country, as do the motivations behind exercising.[9] In some countries, people exercise primarily indoors, and in others, people exercise primarily outdoors. People may exercise for personal enjoyment, health and well-being, social interactions, competition or training, etc. These differences could potentially be attributed to geographic location, social tendencies, or otherwise.

…

These sociocultural variations in physical exercise show how people in different geographic locations and social climates have varying motivations and methods of exercising. Physical exercise can improve health and well-being, as well as enhance community ties and appreciation of natural beauty.[9]

Nutrition and recovery

Proper nutrition is as important to health as exercise. When exercising, it becomes even more important to have a good diet to ensure that the body has the correct ratio of macronutrients while providing ample micronutrients, in order to aid the body with the recovery process following strenuous exercise.[154]

Active recovery is recommended after participating in physical exercise because it removes lactate from the blood more quickly than inactive recovery. Removing lactate from circulation allows for an easy decline in body temperature, which can also benefit the immune system, as an individual may be vulnerable to minor illnesses if the body temperature drops too abruptly after physical exercise.[155]

Yorum

Adalelerin çalıştırılması, kısaca spor yapılması bireysel olma ötesinde, aile, gelenek ve toplumsal boyutu ile öne çıkmaktadır.

Spor yapmak ile büyüme ve gelişme boyutu ile, şişmanlık ve yağlanmanın önüne geçilmesi için, dengeli ve yeterli beslenilmelidir. Bunun anlamı kalorili yiyecek değildir. Yüksek kalorili yemek, ancak sporcular ve rekor kırmak amacında olanlara gerekli olabilir. Sağlıklı olmak için sporda kalori desteğine gereksinimi olmamalıdır.

15) Exercise physiology

Exercise physiology is the physiology of physical exercise. It is the study of the acute responses and chronic adaptations to a wide range of exercise conditions.

Exercise physiologists study the effect of exercise on pathology, and the mechanisms by which exercise can reduce or reverse disease progression.

Yorum

Adalelerin çalışması açısından yapılan egzersizin birçok etkileşimleri bulunmaktadır. Bu açıdan geniş bir alını kapsamaktadır. Genel veriler Tablo/Şekil 4'de sunulmaktadır

16) Strength and conditioning coach

A **strength and conditioning coach** is a fitness and physical performance professional who uses exercise prescription specifically, but not limited, to improve the performance of competitive athletes.[1] This is achieved through the combination of strength training and aerobic conditioning, alongside a variety of further methods. Strength and conditioning coaches also help athletes with injury prevention and proper mechanics within their sports performances.[2]

Employment characteristics

Strength and conditioning coaches may work with sports teams, as well as individuals. Strength and conditioning coaches are often employed by higher education institutions and professional athletic teams.

Strength and conditioning coaches have the option to specialize in a particular sports team, type of performance, training type, training philosophy, or work in the collegiate level, where they are assigned a sport. The general description and duty of a strength and conditioning coach is to develop an exercise prescription plan that modulates aerobic, resistance, and/or flexibility training to suit the metabolic and physical demands of the sport in question.[1] With aerobic exercise prescription, strength and conditioning coaches determine the type, duration, and frequency of each exercise. For resistance exercise prescription, the type of exercise, total session volume, rest period, frequency, and intensity are determined.[3] They may also be involved in prescription of stretching routines or other approaches. Nutrition and medical consultation are not within their scope of practice and training qualifications.

Qualification standards

Effectiveness

The implementation of effective strength and conditioning programmes has led to an increase in speed and strength.[6][7][8] Research has demonstrated that not only does training improve performance but incorrect training (distance running, a slow-twitch muscle fiber activity, in football athletes with fast-twitch characteristics) can cause decrements to performance. Using techniques such as plyometrics in some high-power athletes and sports-specific movements in others, strength coaches may improve physical function and athletic performance.[9]

Criticism

Criticism has followed the increased use of strength and conditioning coaches in a variety of sports due to the shift in importance to the size and speed of the players. In rugby union, a game with heavy physical contact and minimal[*clarification needed*] protection, players are being described as being "too big", creating collisions that are increasing the risk of short and long term injuries.[10] Further, it has been proposed that the increased weight and speed of players and subsequent rise of collision force leads to more frequent and severe concussion injuries.[11][12]

However, there is as yet no research to suggest an increased use of strength and conditioning leading to an increased risk of injury.[*citation needed*]

Yorum

İnsanların bedenlerinin güçlenmesi ve kondisyonları açısından kendilerinin bilgi ve becerileri ile sonuç almaları beklenilmemelidir. Sadece kültür-fizik işlemleri yapabilmeleri, sağlık açısından bir boyut kazandırabilmektedir. Güçlenme ise bir uzmanlık işidir, Şekil 1'de sunulduğu gibi her bireyin kapasitesi ve hedeflenen sonuç ayrışmaktadır. Anaerobik yapı ile sorunlu boyutun olmasından kaçınılmalıdır.

Sonuç

Adalelerin çalışması için enerji gereklidir. Ancak enerji gereksinimi açısından ek kalori ve besin desteği yapılmamalıdır. Günlük aldıklarımız yeterlidir. Ek kalori için, meslek olarak atlet olanlar ve rekor peşinde koşanların sorunu olmaktadır.

Bizler için dikkat edilecekler aerobik egzersiz temelinde yaklaşım yapmaktır.

Kısaca

a) Isınma hareketi; gücünün korunması: kalbin 100 atım civarında olmalıdır
b) Sağlık için; Bedenin çalışması, yağların yakılması: 120 atım dakikada atımının korunması
c) Eğitim amaçlı; Spor, futbol ve bir oyunda: kalp atımı 140 atım dakikayı geçmemelidir
d) KAÇINACAK BOYUT: Zorlama; kalp atımının 160 atım olması durumu
e) TEHLİKE: Maksimum güç; enerjinin tüketilmesi: kalp atımının 180 atım civarına çıkmasıdır.

NOT: Kardiyolojik Efor testlerinde yaşa göre uyarlanan yaklaşım ile, devamlı EKG kontrolü ile yapılan değerlendirmelerde; 20 yaşında bir kişinin 180 nabız ve üstünde bir eforlu işlev yapmamalı, 70 yaşında birisi için bu 135 atım dakikadır. Ayrıca ön tetkikler yapılmadan ve bunlarda sorun gözlenmeden bu test yapılabilir. Ekokardiyografi ve EKG sorunsuz olanlar için efor testi yapılır.

Sonuç; sağlıklı olabilmek için her birey, kendine göre bir program içinde, devamlı ve planlı olarak spor yaklaşımı yapmalıdır. Spor yapmak için ek kaloriye gereksinim olmadığı, dengeli ve yeterli beslenme gerekli olduğu, proteinin ise üst kalitede olmasına özen gösterilmelidir.