Bölüm

1

Güçün Sınırlanması

Laktik Asit Kontrolü*

*M. Arif AKŞİT***

Bir sporcuyla konuşulan konular iletilmektedir.
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İnsan bir birey olarak belirli kapasitesi vardır. Bu yapı, adalenin güçlü olması ötesine, belirli bir bilimsel gelişim ve değişimi gündeme getirmektedir. Ancak, kontrolsüz güç, güç değildir, bunun kontrolü, çeviklik, düşünme boyutu ile etik olmada, insanlıkta yatmaktadır. Bedensel olarak sınırlandıran laktik asit olmaktadır. Bu kapasitenin artması bireysel özellik yanında jimnastik ile oluşmaktadır.

Sizin spor yaptığınızda adale gücünü kontrol eden laktik asit düzeyi olmaktadır. Adaledeki ağrı ve enerji noksanlığı da bu birikimi gündeme getirir.

Sporcu seçimi, özellikle rekor kırma, olimpiyat seçmelerinde, bireyin yaptığı rekor ötesinde, bedeninde laktik asit üretimi ve metabolizmasını da kontrol edilmektedir.

Laktik asit yönetimi rekor kırmanın ötesinde, bireyin vücudunun işlevini de ortaya koymaktadır.

Sporda laktik asit ve bunun yönetimi konusu işlenecektir.

Özet
Laktik Asit Kontrolü

Amaç: Spor demek adale gücü, adale işlemine dayanan bir eylem olmaktadır. Burada istenen, beklenen ilke "***Ben sporcunun zeki, çevik ve ahlaklısını severim***" olmalıdır. İnsanın gücünü sınırlandıran, yorgunluk, ağrı ve adale sertliğini yapan laktik asit ile spordaki sınırlarımız ortaya çıkmaktadır.
Dayanaklar/Kaynaklar: Wikipedia, Google biliminin yorumu ile laktik asitin gücümüzü sınırlandırması açısından önemi ortaya konulmaktadır.
Genel Yaklaşım; Laktik asitin adalenin enerji sağlanmasında, depo ATP ile glikoliz yolu ile oluşan laktik asit ve oksijenli yol ile enerji transferi gündeme getirilerek, adalelerin sınırına ulaşması durumunda, oluşan laktik asitin bize yol gösterici olduğu ortaya konulmaktadır.
Yaklaşım: Laktik asitin adale işlevlerinde rolü ortaya konulurken, adale, enerji oluşumu konularında da görüşler sunularak değerlendirme yapılmaktadır.

Sonuç: Adalelerin enerji sağlanmasıyla işlev yaptığı, bunları depo ATP ve glikoliz yanında oksijenlenme ile oluştuğu, ancak biriken laktik asitin, adalede ağrı, sertlik ve yorgunluk oluşturarak bizim sınırlarımızı tayin ettiği vurgulanmaktadır.
Yorum: Laktik asit sporda bize sınırlarımızı göstermesi açısından nerede duracağımızı gösterip, bizim yaşamımızı kurtarıcı olabilmektedir.
Anahtar Kelimeler: Laktik asit, laktik asidoz, ATP, Glikoliz ve aerobik oksijenasyonu

Outline
Controlling of Lactic Acidosis, Lactic Ascites

AIM: Sport and gymnasium is grounding on muscle, muscle power, thus, the principles of sport will be "*be care for, loving, like, the sportspeople, that's, clever, using their mind, the active, agile, using mind, and ethical ones*". The limitation standard is, lactic acidosis, fatigue, spasm and pain, for the sport.
Grounding Aspects: Wikipedia, Google are main references, and the lactic ascites are also considered as a Valuable parameter, on sport.
Introduction: The energy production, by ATP storages, glycolysis and aerobic energy transporting, leading us the lactic Acidosis for the limitations of each person, by muscular power.
Notions: The parameters, fatigue, pain and hardness, spasm will be the precautions of our muscle power.
Conclusion: The lactic ascites is our limitation standard and will be a life saver to us, not to go far
Key Words: Muscle power, lactic acidosis, lactic ascites, ATP storage, glycolysis and aerobic oxygenations

Giriş

Spor temelde belirli akılcı yaklaşım ile sağlıklı olmanın bütünleşmesidir. Elde edilen bireysel veya grup, ekip olarak başarının, bir zafer olmadığı veya mağlubiyetin, bir sosyal yıkım olarak değil, bir insanlık boyutunda iletişim ve ilişki sağlamak olduğu kavranmalıdır.

Toplumun bir oyun ile kuralları ve ilkeleri ile ahlaklı, etik olma boyutu geliştirilmelidir. Sporda kötü söz bile kabul edilemediği gibi, bir düşmanlık veya bir çatışma gerekçesi olmamalıdır.

Kabile zihniyetinde olan durumda, kazanma varlık, kaybetme ise yokluk olarak görülerek bir çatışma boyutu, gerekçesi oluşturulmamalıdır. Spor bu şekilde ele alınmamalıdır.

Spor, ahlak unsurları, kısaca etik boyutu oluşturmadığı zaman, yapılan spor değildir. Spor insanlık oluşturmuyor ise, adına spor denilmemektedir.

Sporda en büyük engel, adalelerde oluşan laktik asit ile gücün engellenmesi, kullanılamamasıdır. Oksijenlenme ile elde edilen enerji yanında an-aerobik oluşan metabolizma ürünü laktik asit en tanımlanan yapamama durumudur.

Oğlum ile tenis oynarken, bir arkadaş oyunun kaç, kaç ve kim kazandığını sordu. Biz oyun için oynamıyoruz dedik. Kavrayamadı. Bunun üzerine, hiçbir tenisçi oyun oynamaz dedik, eğitimleri ve beceri ile yeteneklerinde ilerleme için maç yapmaz dedik. Eğer maç yaparsanız sayı peşinde koşarsınız, ama jimnastikte önemli olan teniste olduğu gibi, vuruş, önden, arkadan, servis gibi teknikleri kullanmak olduğu, atılan topun istenilen yere gidip gitmemesidir dedik. Ayrıca saatlerce oynuyoruz, stressiz ve bir gerçek tenis oyunu oynanıyor dedik. Bakabilir miyim dedi ve sonra bizimle oynamak istemedi. Gerekçesi de çok teknik oynandığı ve bizleri yenemeyeceğini anladığını belirtti. Önemli olanın tenis oynamak olduğu, kazanmak veya kazanmamak olmadığının bilincinde değildi.

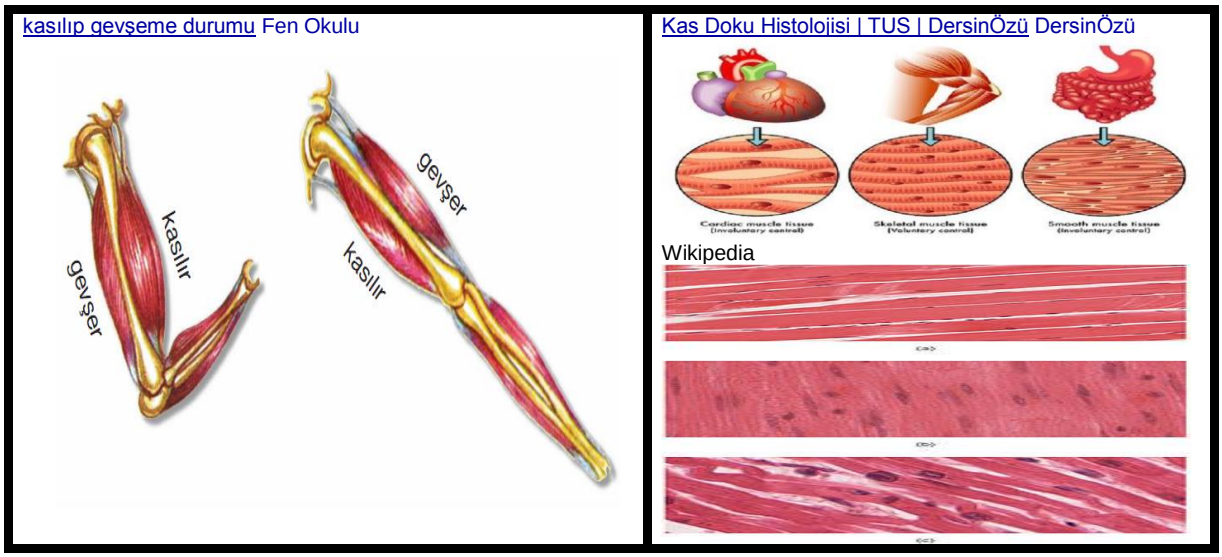
Bir arkadaş, denizde ters dalganın olduğu bir yerde boğuldu ve hekim olarak bir kişinin burada boğulması ile yine bir mühendisin aynı yerde boğulması birçok kişi tarafından açıklaması zor bulunmuştur. Dikkat ve özen göstermek gerekirken, kendi bedenini daha dengeli kullanma ile laktik asitin belirtileri bilinirken, zorlanma, ancak aklın bu zorlukları aşabileceği yanıltması ile oluşabilmektedir. Bu nedenle aklı kullanarak, dengeleri, belirtilere bakarak yaklaşım yapılmalıdır. Ben yaparım değil, bedenim müsaade eder mi denilmelidir.

Spor kazanmak için oynanıyorsa, o oyunda ben olmak istemem, oyun için spor yapılır, yapılmalıdır.

Adale Hakkında Bilgi

Spor basit olarak adalelerin kasılma ve gevşeme işlemidir. Bir adale kasılırken, diğeri de gevşemektedir.

Adale çalışması



Şekil 1: Kasın karşılıklı işlevi, Hücresel görünüm; a) kalp, otonomik çalışım, b) istekle çalışma, c) düz kaslar, otonom çalışma

Vücudumuzda başlıca 3 tipte adale yapısı vardır. Kendi kendini uyararak çalışan, bir bakıma hücre içi v dışı potansiyel fark ile kasılmayı oluşturan kalp adalesi, beyin kontrolü ile oluşan iskelet kasları ve otonom olarak regüle edilen, istemsiz adalelerdir.

Types (Wikipedia)
The body contains three types of muscle tissue: (a) skeletal muscle, (b) smooth muscle, and (c) cardiac muscle. (Same magnification)
Muscle tissue is a soft tissue, and is one of the four fundamental types of tissue present in animals. There are three types of muscle tissue recognized in vertebrates:

- Skeletal muscle or "voluntary muscle" is anchored by tendons (or by aponeuroses at a few places) to bone and is used to effect skeletal movement such as locomotion and in maintaining posture. Though this postural control is generally maintained as an unconscious reflex, the muscles responsible react to conscious control like non-postural muscles. An average adult male is made up of 42% of skeletal muscle and an average adult female is made up of 36% (as a percentage of body mass).[5]
- Smooth muscle or "involuntary muscle" is found within the walls of organs and structures such as the esophagus, stomach, intestines, bronchi, uterus, urethra, bladder, blood vessels, and the arrector pili in the skin (in which it controls erection of body hair). Unlike skeletal muscle, smooth muscle is not under conscious control.
- Cardiac muscle (myocardium), is also an "involuntary muscle" but is more akin in structure to skeletal muscle and is found only in the heart.

Cardiac and skeletal muscles are "striated" in that they contain sarcomeres that are packed into highly regular arrangements of bundles; the myofibrils of smooth muscle cells are not arranged in sarcomeres and so are not striated. While the sarcomeres in skeletal muscles are arranged in regular, parallel bundles, cardiac muscle sarcomeres connect at branching, irregular angles (called intercalated discs). Striated muscle contracts and relaxes in short, intense bursts, whereas smooth muscle sustains longer or even near-permanent contractions.

Skeletal (voluntary) muscle is further divided into two broad types: *slow twitch* and *fast twitch*:

- Type I, slow twitch, or "red" muscle, is dense with capillaries and is rich in mitochondria and myoglobin, giving the muscle tissue its characteristic red color. It can carry more oxygen and sustain aerobic activity using fats or carbohydrates as fuel.[6] Slow twitch fibers contract for long periods of time but with little force.
- Type II, fast twitch muscle, has three major subtypes (IIa, IIx, and IIb) that vary in both contractile speed[7] and force generated.[6] Fast twitch fibers contract quickly and powerfully but fatigue very rapidly, sustaining only short, anaerobic bursts of activity before muscle contraction becomes painful. They contribute most to muscle strength and have greater potential for increase in mass. Type IIb is anaerobic, glycolytic, "white" muscle that is least dense in mitochondria and myoglobin. In small animals (e.g., rodents) this is the major fast muscle type, explaining the pale color of their flesh.

The density of mammalian skeletal muscle tissue is about 1.06 kg/liter.[8] This can be contrasted with the density of adipose tissue (fat), which is 0.9196 kg/liter.[9] This makes muscle tissue approximately 15% denser than fat tissue.
Bundles of muscle fibers, called fascicles, are covered by the perimysium. Muscle fibers are covered by the endomysium.

Yorum

Adalelerin farklı yapısı, işlevlerinin farklı olmasındandır. İskelet kaslarında işlev güç kullanımı olduğu için, irdeleme öne çıkmaktadır.

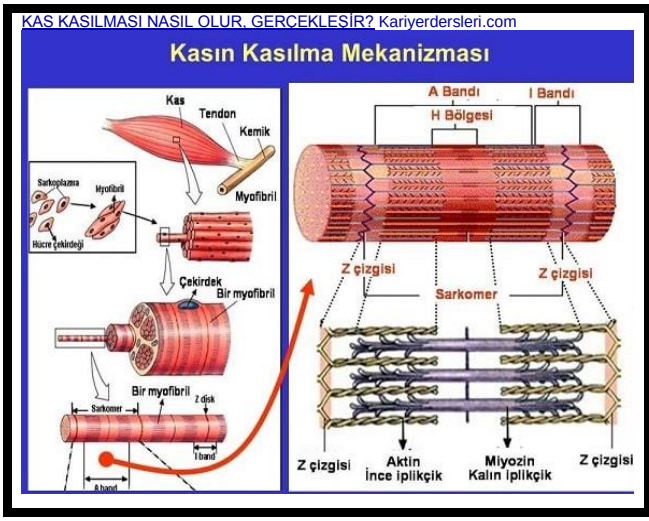
Kasların Çalışması

Bu Bölümde konumuz irade ile çalışan, iskelet kaslarının geliştirilmesi, spor ve diğer bedensel işlevler olarak kullanılmasıdır.

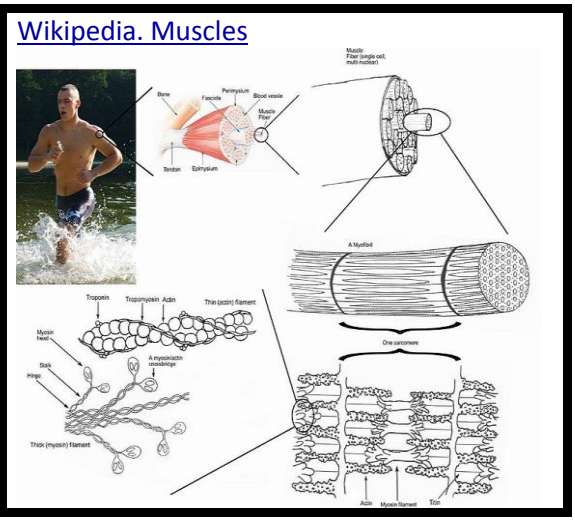
Özellikle iademiz ile çalışan kasların çalışma mekanizmasına değinilecektir. Burada enerji sağlama ve bu enerjinin devamlılığı konusu irdelenmektedir.

Adale çalışması

KAS KASILMASI NASIL OLUR, GERÇEKLEŞİR? Kariyerdersleri.com



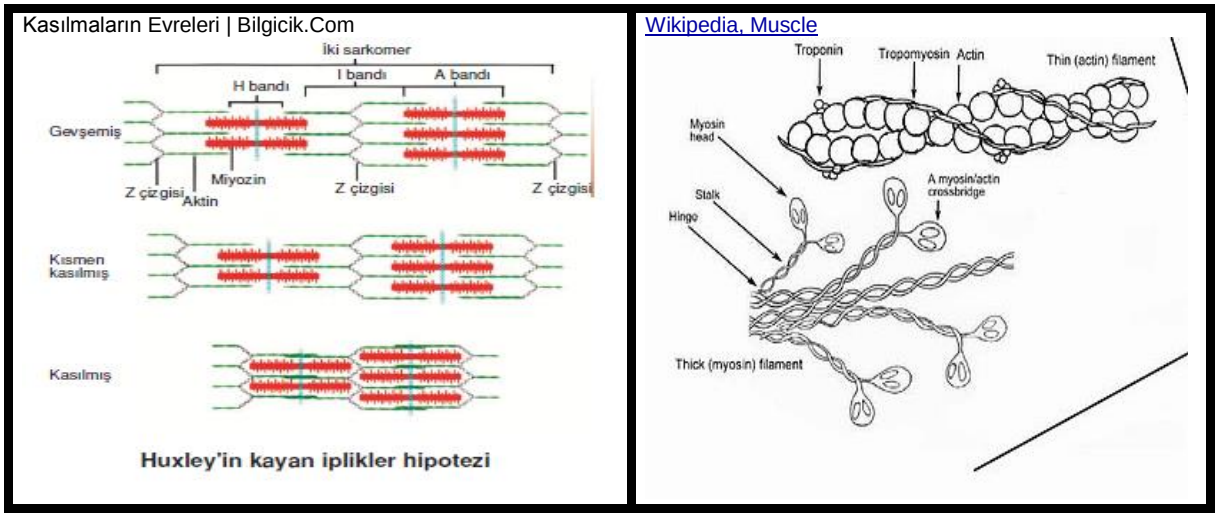
Wikipedia. Muscles



Şekil 2: Kasın karmaşık yapısından işlev gören sarkomer yapıya indirgeme

Adaleler, özellikle istekli hareketleri yapabildiğimiz, spor içinde öne çıkan grup, mikro flamentler (miyosiin), aktin denilen yuvalar içinde kaymasıdır. Bunun için enerji kullanılmaktadır.

Sarkomerde H Bandı, Z bandı içine girip kaymaktadır



Şekil 3: Myosin (Kalın) flamanı, aktin (ince flaman) içinde gidip, gelmektedir

Bu ince yapının zedelenmesi ile Kollajen liflerin araya gireceği ve bu boyutun işlevsiz kalacağıdır. Bu açıdan adalelerin zorlanması, yeterli enerji yok iken, oksijensiz kalması ile sorun büyük olmaktadır.

Standart hareketlerde istirahat yapılan işleve göre değişmektedir. Başlıcaları;

- Hafif adale hareketlerinde 5-10 dakikalık hafif bisiklet sürülmesi, adaledeki depo olan enerji tüketilmektedir. Yenisinin gelmesi için 15 dakikalık süreç gerekir. Bunun anlamı, hafif spordan sonra 1 saat kadar istirahat gerekir.
- Orta dereceli hareketler ile adaledeki mitokondri sayısı, enerji oluşturacak ATP yapım merkezleri arttırılmış olacaktır. Beklenen süreç, 20 dakikadır ve güç orta 5-6 zorluk düzeyde olmalıdır. Hız ayarı 5 civarında tutulmalıdır. İstirahat 3-5 saat olmalıdır.
- Ağır spor ortamında güç 10 derece üstünde, sertlik derecesi 10 civarında ve süreç 20 dakika olmalıdır. Burada bir günlük istirahat yapılmalıdır.
- Zorlama, bedenin kabul edebildiği en üst düzeyde oynama, 12 üstü direnç ile 30-60 dakika süreç yapanlar ise 2-3 günlük bir istirahat yapmalıdırlar. Bu açıdan bir futbol oyunu haftada 2 seferden daha fazla olmamalıdır.

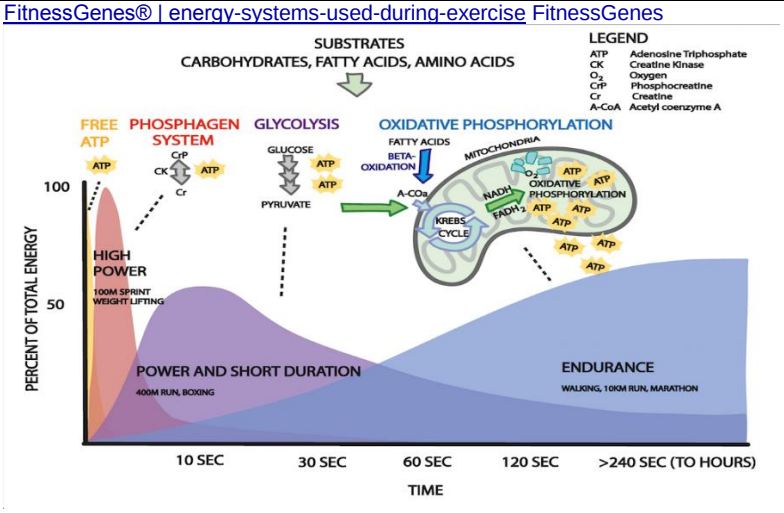
Sonuç

1) İstirahat daha sonraki başarı için gereklidir. Eğer bir takım olimpiyat gibi, puanlı bir maç yapıyorsa, 2-3 gün istirahat etmeli ve oyun oynan şehirde dört veya beş yıldızlı (her ihtiyacı karşılayan otelde) kahvaltı odaya gelmek üzere yapmalıdırlar. Odadan çıkmamalıdırlar. Ülkemizde özellikle madalya alındığında hemen Bakan veya yüksek rütbeli makama sunulmakta, saatlerce beklemek, heyecan ötesi durumlar nedeniyle bir daha madalya alma şansı kaçırılmakta, adaleler tahribine neden olunmaktadır. Takım ile giden hekimler bu konuda etkin bilgi ötesi, yetkin olmalı ve takım elemanlarının otelde odada kalmalarını sağlamalıdır.
2) Uyuma, istirahat olmadan yarış kazanılamaz. Bir başka boyut, olimpiyatlarda madalya beklenen bir atletimiz, gece 03:00 kaldırılarak, doping kontrolü yapılacağı ifadesi ile saatlerce uyutulmayıp, sekize kadar ayakta tutulmuştur. Bir kere doping rekor kıranlarda yapılır, kişilerin uyuması en önemli bir kutsal süredir. Adalede uykusuzluk ve endişe nedeni ile oluşan adrenalin ATP yıkımı yapar. Bu bir tuzaktır. Bunu yapan suçlanmalı ve mahkûm edilmeli iken, takımın başındaki yöneticiler ile birlikte tetkik yapılmış, bir bakıma suçlamanın düşmesine neden olunmuştur. Sonuçta atlet katılmak istememiş ve zorla yarışa sokulup, ömründeki en kötü sonuç olan beşinci olmuştur. Adaleler tahrip

olduğu için, eski başarısını sağlamakta çok zorlanmıştır. Bu basit olarak yukarıda belirtilen konuları bilmemektir.

3) Oda da sivrisinek olmamalıdır. Bir odada sivrisinek var ise o odadan başarı elde edilemez. Kişiler uyuyamazlar. Rahatsız olan bir kişi bile olsa, diğerlerini uyutmazlar.
4) Etik, ahlak durumu olmaz ise istirahat yapılamaz. Özellikle başarılı olacak takımların etrafında çeşitli kişiler olur, imza, pohpohlama, içki ve alem yapılması ile bireylerin uyumaması sağlanır. Başarısız olununca zaten kimse etraflarında kalmaz. Ayrıca madalya olanağı olmayanların etrafında da kimse bulunmaz. A-seksüel (hekimlerde olduğu gibi) olmayanlar atletlerle birlikte bulunamazlar. Atletler vücutlarında oluşan enerjiyi atabilmeleri, terlemeleri için hafif giyinmek zorundadırlar.
5) Yarışma öncesi depo ATP oluşması, yarışma sonrası laktik asitin tahribatından korunmak için istirahat gereklidir.

Enerji oluşumu

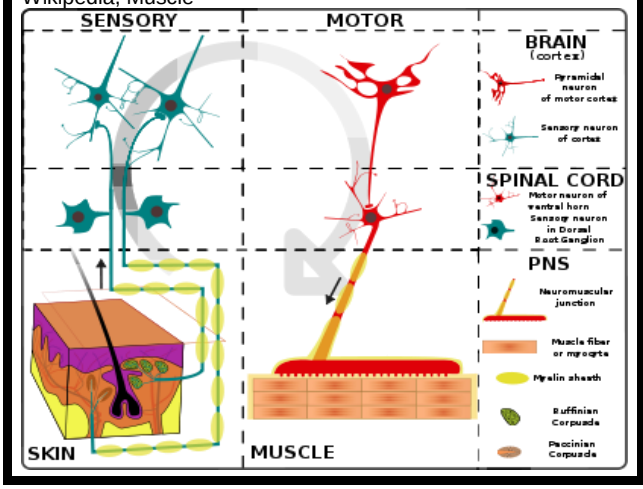


Enerji Oluşumu
a) —Adalede istirahat halinde depo şeklinde ATP vardır. Herhangi bir uyaran ile bu enerji kullanılır. 15 saniye içinde yenileri sentezlenir.
b) —Depo enerji ile (vücuttaki glikojen) her glikozdan iki ATP ve 2 molekül pirüvik asit oluşturulur. Oksijensiz enerji sağlanması olup, daha ileri oluşum ile pirüvik asitten laktik asit oluşmaktadır, yorgunluğu oluşturan maddedir.
c)—Oksijen sağlanması ile glikoz karbondioksit ve 36 ATP üretimini gerçekleştirir. Adaleler istirahatte veya orta dereceli enerji temininde enerji sağlanır. İstirahat depolama açısından önemlidir.

Şekil 4: Enerji kullanımı üç yolla sağlanmaktadır; mevcut ATP, anaerobik ve aerobik yollarla

Adalede enerji olur ve enerji kullanılabilirse işlev oluşur. Hiper-trofik ve hiperplazik olabilir ama işlevsel değil ise, metabolik hastalıklarda sorunlar gözlenebilmektedir. Bu açıdan sinir iletisi de doğrusal boyutta olmalıdır.

Adalelerde sinirsel iletişim



Adalelerin komuta merkezi
İstekli Adaleler:
- Nöronlar alıcıları sayesinde uyaranlar alırlar
- Korteksten piramidal nöronlardan komut gelir
- Bu komut Dentrik, sinir uzantıları sayesinde iletilir
- Bu uyarı iletenler myelin ile kaplıdır, uyaranda kaçak olmamalıdır.
- Bu uyaranlar çaprazlaşır, sağ beyin, sola; sol taraf sağa hükmeder
- Omurgadaki sinir hücrelerine gelen lifler, buradaki hücreler ile uyarıyı paylaşır ve iletilirler
- Omurilikteki hücreler doku gruplarına giderek istenen etkiyi yapar. Adale grupları kasılırken, diğerleri de gevşemelidir.

Otonom sinirler
- Uyarıları doku etrafındaki sinir ağından alır
- Korteks duyu merkezine iletilir, dokuya da etki gider

Kalp adalesi
- Otonom uyaran hücre /AVN (atrioventriküler nodül)

Şekil 5: Sinirsel ileti bozukluklarında ileti gitmez ve adaleler patolojik işlevi olur veya iş göremezler

Adale

1) Muscle (Wikipedia)

Muscle is a soft tissue found in most animals. Muscle cells contain protein filaments of actin and myosin that slide past one another, producing a contraction that changes both the length and the shape of the cell. Muscles function to produce force and motion. They are primarily responsible for maintaining and changing posture, locomotion, as well as movement of internal organs, such as the contraction of the heart and the movement of food through the digestive system via peristalsis.

Muscle tissues are derived from the mesodermal layer of embryonic germ cells in a process known as myogenesis. There are three types of muscle, skeletal or striated, cardiac, and smooth. Muscle action can be classified as being either voluntary or involuntary. Cardiac and smooth muscles contract without conscious thought and are termed involuntary, whereas the skeletal muscles contract upon command.[1] Skeletal muscles in turn can be divided into fast and slow twitch fibers.
Muscles are predominantly powered by the oxidation of fats and carbohydrates, but anaerobic chemical reactions are also used, particularly by fast twitch fibers. These chemical reactions produce adenosine triphosphate (ATP) molecules that are used to power the movement of the myosin heads.[2]
The term muscle is derived from the Latin *musculus* meaning "little mouse" perhaps because of the shape of certain muscles or because contracting muscles look like mice moving under the skin.[3][4]

Yorum

Canlıların en büyük özelliği hareket edebilmeleridir. Bitkiler selüloz nedeniyle oluşan hücre duvarları onların aktif hareketine olanak sağlamasa da büyüme ve gelişme ile aktivitelerini gösterirler.

Hayvanlar ve İnsanlar temelinde aktif hareketi sağlayan oluşumlar adalelerdir. Bunların 3 farklı yapısı yanında elde ettikleri enerji aynı kaynaktan gelmektedir. Metabolizma oluşturduğu, özellikle mitokondrinin (hücre enerji kazanı) ikinci iç zarında oluşan mekanizma ile elektron transportu olmakta ve buradan ATP oluşumu gözlenmektedir. Bunlar protein, karbonhidratlar ve yağın metabolize olması ile oluşurlar. Hücre içindeki kaynak sıklıkla glikoz temellidir.

Otonom sinir sisteminde üç temel işlev gözlenir; Alfa, Beta ve Gamma reseptörler ile oluşmaktadır. Alfa ve Beta reseptörler cAMP etkileşimi (Adrenerjik), Gamma reseptörler de cGMP ile etkileşim (Kolinerjik) olmaktadır. Adrenerjik sistem, nor-adrenalin (kasılma), adrenalin (doza bağımlı kasılma-gevşeme) iken, Kolinerjik sistem, asetil kolin ile özellikle gevşeme gözlenir.

Physiology
Energy Consumption
Muscular activity accounts for much of the body's energy consumption. All muscle cells produce adenosine triphosphate (ATP) molecules which are used to power the movement of the myosin heads. Muscles have a short-term store of energy in the form of creatine phosphate which is generated from ATP and can regenerate ATP when needed with creatine kinase. Muscles also keep a storage form of glucose in the form of glycogen. Glycogen can be rapidly converted to glucose when energy is required for sustained, powerful contractions. Within the voluntary skeletal muscles, the glucose molecule can be metabolized anaerobically in a process called glycolysis which produces two ATP and two lactic acid molecules in the process (note that in aerobic conditions, lactate is not formed; instead pyruvate is formed and transmitted through the citric acid cycle). Muscle cells also contain globules of fat, which are used for energy during aerobic exercise. The aerobic energy systems take longer to produce the ATP and reach peak efficiency, and requires many more biochemical steps, but produces significantly more ATP than anaerobic glycolysis. Cardiac muscle on the other hand, can readily consume any of the three macronutrients (protein, glucose and fat) aerobically without a 'warm up' period and always extracts the maximum ATP yield from any molecule involved. The heart, liver and red blood cells will also consume lactic acid produced and excreted by skeletal muscles during exercise.
At rest, skeletal muscle consumes 54.4 kJ/kg (13.0 kcal/kg) per day. This is larger than adipose tissue (fat) at 18.8 kJ/kg (4.5 kcal/kg), and bone at 9.6kJ/kg (2.3 kcal/kg).[15]

Yorum

İnsanlarda sindirim sistemi ile gelen besin öğeleri vücutta depolanır. Protein yapıma gitmiyorsa, yıkılarak glikojen (vücuttaki karbonhidrat-şeker deposu) ve yağ olarak birikir. Glikojen adrenalin veya enerji gereksinimlerinde hızlı şekilde parçalanır ve Glukoz-6-Fosfat yapısındadır. Yıkım devam ederek 2,3, Difosfo-gliserat ve pirüvik asit, takiben asetil Ca ile Kreps döngüsünde oksijenle yakım, enerji üretimi olmaktadır. Lipid ve amonyum çıktıktan sonra protein de bu döngüden girip yakılmaktadır.

İlk aşmada depo ATP kullanılması olmaktadır. Bunun birikmesi için istirahat önemlidir. İstirahat stress altında olursa, adrenalin deşarjı nedeniyle ATP birikemez.

İkinci aşama ile enerji oluşumu yanında oluşan Laktik asit nedeniyle eylemlerde kısıtlama olur. Aerobik olması, laktik asit oluşmaması, kısaca işlevin devamı anlamındadır. Bu açıdan akciğer ile

bedendeki bu uyum, sporcunun etkinliğini gösterir. Her atletin bu düzeyleri bilinmeli ve buna göre atlet olmalıdır. İlk aşaması yüksek olan 100 metre koşunda, son aşaması yüksek olanda maratonda rekor kırabilir. Laktik asit yüksekliğini maraton koşan yakabilen ve tolere eden olmalıdır. Ergo spirometry bu işlev içindir.

Yüzerken adalelere spazm, kramp girmesi de laktik asit temelinde oluşmaktadır. Oksijenlenme yeterli olsa bile, dolaşım soğuk su nedeniyle etkin kanlanmayı sağlamayacağı için, kramp ileri düzeyde gelişebilir. Açılması zor olduğu için ölüme neden olabilir. Bu nedenle yüzücüler mutlaka en az 2-3 kişi ile yüzmelidirler. Birçok kişinin boğulma sebebi de oluşan kramptır ve yalnız olmalarıdır.

Efficiency

The efficiency of human muscle has been measured (in the context of rowing and cycling) at 18% to 26%. The efficiency is defined as the ratio of mechanical work output to the total metabolic cost, as can be calculated from oxygen consumption. This low efficiency is the result of about 40% efficiency of generating ATP from food energy, losses in converting energy from ATP into mechanical work inside the muscle, and mechanical losses inside the body. The latter two losses are dependent on the type of exercise and the type of muscle fibers being used (fast-twitch or slow-twitch). For an overall efficiency of 20 percent, one watt of mechanical power is equivalent to 4.3 kcal per hour. For example, one manufacturer of rowing equipment calibrates its rowing ergometer to count burned calories as equal to four times the actual mechanical work, plus 300 kcal per hour,[16] this amounts to about 20 percent efficiency at 250 watts of mechanical output. The mechanical energy output of a cyclic contraction can depend upon many factors, including activation timing, muscle strain trajectory, and rates of force rise & decay. These can be synthesized experimentally using work loop analysis.

Yorum

Bazal kalori, endojen işlevler için gerekli olup, bunun enerji olarak karşılanması yaşam için gereklidir. Bu karşılanmaz ise, endojen yıkım ile sağlanır. Kabaca yaşa ve işleve göre farklı olsa da 40 Kalori/kg ile, sıkıntılı ise 80 Kalori/kg gerekmektedir. Büyüme ve gelişme için bebeklerde 140-150Kalori/kg gereksinim vardır. Erişkenlerde ise kaba hesaplama ile, 1500-2000Kalori günlük gereksinim, ağır işçi, koşucu ise 4500Kalori gerekir. Gereksinimden %25 fazlası ancak kilo alınmasına neden olmaktadır. 1000Kalori ise bazal ihtiyaç denilebilir. Özellikle açlık grevlerinde bu kalorinin şekerli, tuzlu su ile verilmesi ile yaşamı uzatılabilmektedir.

Bir nokta da eğer açlık içinde olursanız, endojen protein yıkımı nedeniyle börek solüt yükü, böbrekten atılması gereken miktar 1800mOsmol olup, yemek ile 600-800mOsmol, bazal kalori ile 300mOsmaol olmaktadır. Anne sütü alanlarda ise yük 70-90mosmal civarındadır.

Enerji temini açısından istirahatte olanlar için de 300Kalori iletilmekte, 13Kalori/kg ifade edilmektedir. 3,5 kiloluk yenidoğan için, 45-50 kalori anlamında olup, daha fazla enerji gereksinimi açısından, istirahatte bile 60-80Kal/kg olması beklenir.

Strength

Muscle is a result of three factors that overlap:

- *1) physiological strength* (muscle size, cross sectional area, available crossbridging, responses to training),
- *2) neurological strength* (how strong or weak is the signal that tells the muscle to contract), and
- *3) mechanical strength* (muscle's force angle on the lever, moment arm length, joint capabilities).[*citation needed*]

1) Physiological strength

Grading of muscle strength

Grade 0	No contraction
Grade 1	Trace of contraction, but no movement at the joint
Grade 2	Movement at the joint with gravity eliminated
Grade 3	Movement against gravity, but not against added resistance
Grade 4	Movement against external resistance, but less than normal
Grade 5	Normal strength

Vertebrate muscle typically produces approximately 25–33 N (5.6–7.4 lb_f) of force per square centimeter of muscle cross-sectional area when isometric and at optimal length.[17] Some invertebrate muscles, such as in crab claws, have much longer sarcomeres than vertebrates, resulting in many more sites for actin and myosin to bind and thus much greater force per square centimeter at the cost of much slower speed. The force generated by a contraction can be measured non-invasively using either mechanomyography or phonomyography, be measured in vivo using tendon strain (if a prominent tendon is present), or be measured directly using more invasive methods.

The strength of any given muscle, in terms of force exerted on the skeleton, depends upon length, shortening speed, cross sectional area, pennation, sarcomere length, myosin isoforms, and neural activation of motor units. Significant reductions in muscle strength can indicate underlying pathology, with the chart at right used as a guide.

Yorum

Adale hastalıklarında hekimler başlıca dikkat ettikleri konular;

- Fiziksel gücü: adalenin hacmi, kaldırma gücü, tonusu önemsenir. Bazı adale hastalıklarında adaleler iri ve geniş olsa da kendi gücünü kaldıramaz boyuttadır.
- Nörolojik olarak iletim boyutuna bakılır. Felçlerde bu belirgindir.
- Mekanik güç olarak adalenin belirli bilek bükmesine bakılır.

Sporda tüm bu işlevlerin yerinde olması beklenir. Ayrıca, mekanik güç ile gelişim ve ilerlemenin olması bir beklenti olmaktadır.

The "strongest" human muscle

Since three factors affect muscular strength simultaneously and muscles never work individually, it is misleading to compare strength in individual muscles, and state that one is the "strongest". But below are several muscles whose strength is noteworthy for different reasons.

- In ordinary parlance, muscular "strength" usually refers to the ability to exert a force on an external object—for example, lifting a weight. By this definition, the masseter or jaw muscle is the strongest. The 1992 Guinness Book of Records records the achievement of a bite strength of 4,337 N (975 lb_f) for 2 seconds. What distinguishes the masseter is not anything special about the muscle itself, but its advantage in working against a much shorter lever arm than other muscles.
- If "strength" refers to the force exerted by the muscle itself, e.g., on the place where it inserts into a bone, then the strongest muscles are those with the largest cross-sectional area. This is because the tension exerted by an individual skeletal muscle fiber does not vary much. Each fiber can exert a force on the order of 0.3 micronewton. By this definition, the strongest muscle of the body is usually said to be the quadriceps femoris or the gluteus maximus.
- Because muscle strength is determined by cross-sectional area, a shorter muscle will be stronger "pound for pound" (i.e., by weight) than a longer muscle of the same cross-sectional area. The myometrial layer of the uterus may be the strongest muscle by weight in the female human body. At the time when an infant is delivered, the entire human uterus weighs about 1.1 kg (40 oz). During childbirth, the uterus exerts 100 to 400 N (25 to 100lbf) of downward force with each contraction.
- The external muscles of the eye are conspicuously large and strong in relation to the small size and weight of the eyeball. It is frequently said that they are "the strongest muscles for the job they have to do" and are sometimes claimed to be "100 times stronger than they need to be." However, eye movements (particularly saccades used on facial scanning and reading) do require high speed movements, and eye muscles are exercised nightly during rapid eye movement sleep.
- The statement that "the tongue is the strongest muscle in the body" appears frequently in lists of surprising facts, but it is difficult to find any definition of "strength" that would make this statement true. Note that the tongue consists of eight muscles, not one.
- The heart has a claim to being the muscle that performs the largest quantity of physical work in the course of a lifetime. Estimates of the power output of the human heart range from 1 to 5 watts. This is much less than the maximum power output of other muscles; for example, the quadriceps can produce over 100 watts, but only for a few minutes. The heart does its work continuously over an entire lifetime without pause, and thus does "outwork" other muscles. An output of one watt continuously for eighty years yields a total work output of two and a half gigajoules.[18]

Yorum

En güçlü adalelerin tanımlanması: a) çene kasları en güçlü olanlar, b) kalçadaki, gluteus maksimus, c) uterus adaleleri, d) göz küresini döndüren adaleler, e) dil en güçlü adalelerdendir, f) kalp yaşam boyu çalışan güçlü adaledir.

Exercise

Exercise is often recommended as a means of improving motor skills, fitness, muscle and bone strength, and joint function. Exercise has several effects upon muscles, connective tissue, bone, and the nerves that stimulate the muscles. One such effect is muscle hypertrophy, an increase in size. This is used in bodybuilding.

Various exercises require a predominance of certain muscle fiber utilization over another. Aerobic exercise involves long, low levels of exertion in which the muscles are used at well below their maximal contraction strength for long periods of time (the most classic example being the marathon). Aerobic events, which rely primarily on the aerobic (with oxygen) system, use a higher percentage of Type I (or slow-twitch) muscle fibers, consume a mixture of fat, protein and carbohydrates for energy, consume large amounts of oxygen and produce little lactic acid. Anaerobic exercise involves short bursts of higher intensity contractions at a much greater percentage of their maximum contraction strength. Examples of anaerobic exercise include sprinting and weight lifting. The anaerobic energy delivery system uses predominantly Type II or fast-twitch muscle fibers, relies mainly on ATP or glucose for fuel, consumes relatively little oxygen, protein and fat, produces large amounts of lactic acid and can not be sustained for as long a period as aerobic exercise. Many exercises are partially aerobic and partially anaerobic; for example, soccer and rock climbing involve a combination of both.

The presence of lactic acid has an inhibitory effect on ATP generation within the muscle; though not producing fatigue, it can inhibit or even stop performance if the intracellular concentration becomes too high. However, long-term training causes neovascularization within the muscle, increasing the ability to move waste products out of the muscles and maintain contraction. Once moved out of muscles with high concentrations within the sarcomere, lactic acid can be used by other muscles or body tissues as a source of energy, or transported to the liver where it is converted back to pyruvate. In addition to increasing the level of lactic acid, strenuous exercise causes the loss of potassium ions in muscle and causing an increase in potassium ion concentrations close to the muscle fibres, in the interstitium. Acidification by lactic acid may allow recovery of force so that acidosis may protect against fatigue rather than being a cause of fatigue.[19]

Delayed onset muscle soreness is pain or discomfort that may be felt one to three days after exercising and generally subsides two to three days later. Once thought to be caused by lactic acid build-up, a more recent theory is that it is caused by tiny tears

in the muscle fibers caused by eccentric contraction, or unaccustomed training levels. Since lactic acid disperses fairly rapidly, it could not explain pain experienced days after exercise.[20]

Yorum

Bir kişinin sağlıklı olması için, bedensel adalelerin belirli bir tonusu içinde olmalıdır. Yürüme, az enerji sarf edilmesine karşın, tüm adaleleri çalıştırması ile sağlıklı ortamda dolaşılması ile önemli bir kazanç sağlamaktadır. Saatlerce yürüyebilme ile sosyal iletişim açısından da katkı sağlamaktadır.

Vücuttaki adalelerin geliştirmesi ise farklı bir yapılanmadır. Burada görünüş önemlidir.

Futbol ve güç kullanılarak yapılan spor eylemleri, aerobik yanında anaerobik işlemi de sağlamakta, kısaca laktik asitten dolayı ağrı da gelişebilmektedir.

Health

Humans are genetically predisposed with a larger percentage of one type of muscle group over another. An individual born with a greater percentage of Type I muscle fibers would theoretically be more suited to endurance events, such as triathlons, distance running, and long cycling events, whereas a human born with a greater percentage of Type II muscle fibers would be more likely to excel at sprinting events such as 100 meter dash.[*citation needed*]

Yorum

Sağlıklı olmak için koşmak/jogging, aerobik türünde bir egzersizdir. Bu yol ile daha etkin bir adalenin

Clinical significance

Hypertrophy

Independent of strength and performance measures, muscles can be induced to grow larger by a number of factors, including hormone signaling, developmental factors, strength training, and disease. Contrary to popular belief, the number of muscle fibres cannot be increased through exercise. Instead, muscles grow larger through a combination of muscle cell growth as new protein filaments are added along with additional mass provided by undifferentiated satellite cells alongside the existing muscle cells.[12]

Biological factors such as age and hormone levels can affect muscle hypertrophy. During puberty in males, hypertrophy occurs at an accelerated rate as the levels of growth-stimulating hormones produced by the body increase. Natural hypertrophy normally stops at full growth in the late teens. As testosterone is one of the body's major growth hormones, on average, men find hypertrophy much easier to achieve than women. Taking additional testosterone or other anabolic steroids will increase muscular hypertrophy.

Muscular, spinal and neural factors all affect muscle building. Sometimes a person may notice an increase in strength in a given muscle even though only its opposite has been subject to exercise, such as when a bodybuilder finds her left biceps stronger after completing a regimen focusing only on the right biceps. This phenomenon is called cross education.[*citation needed*]

Yorum

Egzersiz ile adalenin gelişimi için adalenin zorlanması önemlidir. Devamlı uygulanan karşı güce karşı, adalede gelişim önemlidir. Aynı oranda olması, adalenin mevcut durumunu sağlayabilir.

Atrophy

Prisoner of war exhibiting muscle loss as a result of malnutrition. Muscles may atrophy as a result of malnutrition, physical inactivity, aging, or disease.

Inactivity and starvation in mammals lead to atrophy of skeletal muscle, a decrease in muscle mass that may be accompanied by a smaller number and size of the muscle cells as well as lower protein content.[21] Muscle atrophy may also result from the natural aging process or from disease.

In humans, prolonged periods of immobilization, as in the cases of bed rest or astronauts flying in space, are known to result in muscle weakening and atrophy. Atrophy is of particular interest to the manned spaceflight community, because the weightlessness experienced in spaceflight results is a loss of as much as 30% of mass in some muscles.[22][23] Such consequences are also noted in small hibernating mammals like the golden-mantled ground squirrels and brown bats.[24]

During aging, there is a gradual decrease in the ability to maintain skeletal muscle function and mass, known as sarcopenia. The exact cause of sarcopenia is unknown, but it may be due to a combination of the gradual failure in the "satellite cells" that help to regenerate skeletal muscle fibers, and a decrease in sensitivity to or the availability of critical secreted growth factors that are necessary to maintain muscle mass and satellite cell survival. Sarcopenia is a normal aspect of aging, and is not actually a disease state yet can be linked to many injuries in the elderly population as well as decreasing quality of life.[25]

There are also many diseases and conditions that cause muscle atrophy. Examples include cancer and AIDS, which induce a body wasting syndrome called cachexia. Other syndromes or conditions that can induce skeletal muscle atrophy are congestive heart disease and some diseases of the liver.

Yorum

Burada adalenin işlevsel olarak düşük olması, bir guadriseps için 4-7 gün içinde adalede azalma gözlenecektir. Adalenin toparlanması için 2 haftaya yakın bir çabayı gerekli kılar. Yıkım hızlı iken, yapım daha yavaş olmaktadır.

Disease

Neuromuscular diseases are those that affect the muscles and/or their nervous control. In general, problems with nervous control can cause spasticity or paralysis, depending on the location and nature of the problem. A large proportion of neurological

disorders, ranging from cerebrovascular accident (stroke) and Parkinson's disease to Creutzfeldt–Jakob disease, can lead to problems with movement or motor coordination.
Symptoms of muscle diseases may include weakness, spasticity, myoclonus and myalgia. Diagnostic procedures that may reveal muscular disorders include testing creatine kinase levels in the blood and electromyography (measuring electrical activity in muscles). In some cases, muscle biopsy may be done to identify a myopathy, as well as genetic testing to identify DNA abnormalities associated with specific myopathies and dystrophies.
A non-invasive elastography technique that measures muscle noise is undergoing experimentation to provide a way of monitoring neuromuscular disease. The sound produced by a muscle comes from the shortening of actomyosin filaments along the axis of the muscle. During contraction, the muscle shortens along its longitudinal axis and expands across the transverse axis, producing vibrations at the surface.[26]

Yorum

Hastalıklarda sinirsel olduğu kadar metabolizma ile yıkımda düşüklük gözlenmektedir.

2) Exercise Physiology (Wikipedia)

Energy expenditure

Humans have a high capacity to expend energy for many hours during sustained exertion. For example, one individual cycling at a speed of 26.4 km/h (16.4 mph) through 8,204 km (5,098 mi) over 50 consecutive days expended a total of 1,145 MJ (273,850 kcal; 273,850 dieter calories) with an average power output of 182.5 W.[1]
Skeletal muscle burns 90mg (0.5 mmol) of glucose each minute during continuous activity (such as when repetitively extending the human knee),[2] generating ≈24 W of mechanical energy, and since muscle energy conversion is only 22–26% efficient,[3] ≈76 W of heat energy. Resting skeletal muscle has a basal metabolic rate (resting energy consumption) of 0.63 W/kg[4] making a 160 fold difference between the energy consumption of inactive and active muscles. For short duration muscular exertion, energy expenditure can be far greater: an adult human male when jumping up from a squat can mechanically generate 314 W/kg. Such rapid movement can generate twice this amount in nonhuman animals such as bonobos,[5] and in some small lizards.[6]
This energy expenditure is very large compared to the basal resting metabolic rate of the adult human body. This rate varies somewhat with size, gender and age but is typically between 45 W and 85 W.[7] [8] Total energy expenditure (TEE) due to muscular expended energy is much higher and depends upon the average level of physical work and exercise done during a day.[9] Thus exercise, particularly if sustained for very long periods, dominates the energy metabolism of the body. Physical activity energy expenditure correlates strongly with the gender, age, weight, heart rate, and VO_2 max of an individual, during physical activity.[10]

Yorum

Bir beden enerji olarak glikozu kullanır, egzersiz yaparken, insüline bağımlı olmadan da geçiş tanımlanmıştır. Kısaca zayıflama için her dakikada 90mg şeker yakılırsa, bunun ağır ve yaygın olması ile enerji kullanımı farklı olmaktadır. Yüzme daha geniş adale iken, bisiklet daha az adaleleri ilgilendirir ama harcanan güç farklı olabilmektedir.

Her bir spor cihazında enerji kullanımı açısından farklı usuller, modeller verilmektedir; 1) doğrudan yüksek güç ile çalışma, sadece sporcu olanlara önerilir, 2) yavaştan başlayarak, kademeli arttırma, oksijenli enerji sağlanmasını temin ve basamaklı çalışmadır, 3) belirli zamanlarda güç isteme, zorlamalı yöntem ile adalelerin zorlanması beklenir, 4) farklı çalışma yöntemleri ile adaleler çalışırken, arada düşük tempo ile laktik asitin oksijenlenmesi ile giderilmesidir.

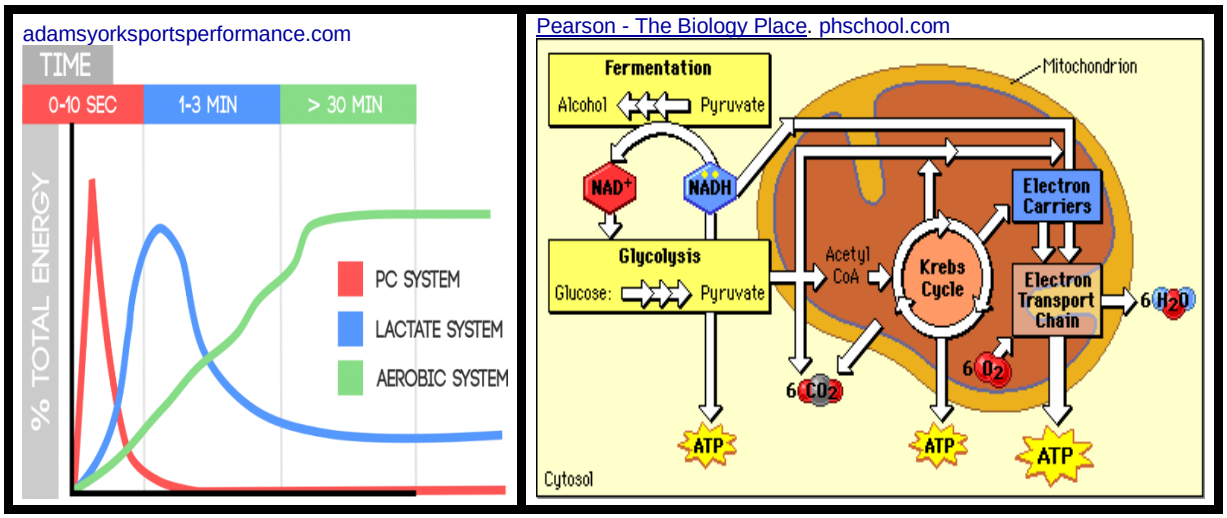
Tüm çalışmalar sistematik devamlılık ve eğer isteniyorsa giderek ağırlaştırma ve uzatmadır. Her insan spor yapmalı ama her bireyden madalya beklenmemelidir.

Rapid energy sources
Energy needed to perform short lasting, high intensity bursts of activity is derived from anaerobic metabolism within the cytosol of muscle cells, as opposed to aerobic respiration which utilizes oxygen, is sustainable, and occurs in the mitochondria. The quick energy sources consist of the phosphocreatine (PCr) system, fast glycolysis, and adenylate kinase. All of these systems re-synthesize adenosine triphosphate (ATP), which is the universal energy source in all cells. The most rapid source, but the most readily depleted of the above sources is the PCr system which utilizes the enzyme creatine kinase. This enzyme catalyzes a reaction that combines phosphocreatine and adenosine diphosphate (ADP) into ATP and creatine. This resource is short lasting because oxygen is required for the resynthesis of phosphocreatine via mitochondrial creatine kinase. Therefore, under anaerobic conditions, this substrate is finite and only lasts between approximately 10 to 30 seconds of high intensity work. Fast glycolysis, however, can function for approximately 2 minutes prior to fatigue, and predominately uses intracellular glycogen as a substrate. Glycogen is broken down rapidly via glycogen phosphorylase into individual glucose units during intense exercise. Glucose is then oxidized to pyruvate and under anaerobic condition is reduced to lactic acid. This reaction oxidizes NADH to NAD, thereby releasing a hydrogen ion, promoting acidosis. For this reason, fast glycolysis can not be sustained for long periods of time. Lastly, adenylate kinase catalyzes a reaction by which 2 ADP are combined to form ATP and adenosine monophosphate (AMP). This reaction takes place during low energy situations such as extreme exercise or conditions of hypoxia, but is not a significant source of energy. The creation of AMP resulting from this reaction stimulates AMP-activated protein kinase (AMP kinase) which is the energy sensor of the cell. After sensing low energy conditions, AMP kinase stimulates various other intracellular enzymes geared towards increasing energy supply and decreasing all anabolic, or energy requiring, cell functions.[*citation needed*]

Yorum

Enerji gereksinimine göre metabolizma olmaktadır. Depo ATP ile glikoliz yolu ile laktik asit üretilmesi ile oluşan ve oksijenle temin edilmesi arasında farklılıklar vardır. ATP glikoliz ve Krebs döngüsü ile de oluşmanın kısaca elektron Transport sisteminde ortaya çıkan enerji mukayesesinde, %2-4 karşın, %40 gibi on kat daha fazla bir etkisi vardır.

Enerji kullanımı aşamaları



Şekil 6: Enerji; a) depo ATP, b) Glikoliz, laktik asit üretimi, c) oksidatif, Krebs döngüsü ile

Oksijenli ve Oksijensiz Solunum

Aerobik Solunum	**Anaerobik Solunum**
• Oksijen kullanılır. • Sitoplazmada ve mitokondride gerçekleşir. • ETS görev yapar • Hem substrat düzeyinde hem de fosforilasyonla ATP üretilir. • Enerji verimi %40'dır • Koenzim olarak NAD ve FAD kullanılır. • Son elektron alıcısı oksijendir • 1 molekül glikozdan 40 ATP üretilir. Net kazanç 38 ATP'dir. • Glikoz, su ve karbondioksite parçalanır	• Oksijen kullanılmaz • Sitoplazmada kullanılır • ETS görev yapmaz • Substrat düzeyinde fosforilasyonla ATP üretilir. • Enerji verimi %2-10 arasında • Koenzim olarak NAD kullanılır • Son elektron alıcısı laktik asit fermantasyonunda pirüvattır • 1 molekül glikozdan 4 ATP üretilir. Net kazanç 2 ATP'dir. • Glikoz, laktik asite vb. parçalanır.

Şekil 7: Anaerobik solunumda hücre sağlıklı olduğu durumlarda da enerji üretebilmektedir. Laktik asit dokuda ağrı ve diğer sorunlar oluştursa bile yaşam sürdüğü sürece geri dönüş olasıdır.

Plasma glucose

Plasma glucose is said to be maintained when there is an equal rate of glucose appearance (entry into the blood) and glucose disposal (removal from the blood). In the healthy individual, the rates of appearance and disposal are essentially equal during exercise of moderate intensity and duration; however, prolonged exercise or sufficiently intense exercise can result in an imbalance leaning towards a higher rate of disposal than appearance, at which point glucose levels fall producing the onset of fatigue. Rate of glucose appearance is dictated by the amount of glucose being absorbed at the gut as well as liver (hepatic) glucose output. Although glucose absorption from the gut is not typically a source of glucose appearance during exercise, the liver is capable of catabolizing stored glycogen (glycogenolysis) as well as synthesizing new glucose from specific reduced carbon molecules (glycerol, pyruvate, and lactate) in a process called gluconeogenesis. The ability of the liver to release glucose into the blood from glycogenolysis is unique, since skeletal muscle, the other major glycogen reservoir, is incapable of doing so. Unlike skeletal muscle, liver cells contain the enzyme glycogen phosphatase, which removes a phosphate group from glucose-6-P to release free glucose. In order for glucose to exit a cell membrane, the removal of this phosphate group is essential. Although gluconeogenesis is an important component of hepatic glucose output, it alone can not sustain exercise. For this reason, when glycogen stores are depleted during exercise, glucose levels fall and fatigue sets in. Glucose disposal, the other side of the equation, is controlled by uptake of glucose at the working skeletal muscles. During exercise, despite

decreased insulin concentrations, muscle increases GLUT4 translocation of and glucose uptake. The mechanism for increased GLUT4 translocation is an area of ongoing research.
glucose control: As mentioned above, insulin secretion is reduced during exercise, and does not play a major role in maintaining normal blood glucose concentration during exercise, but its counter-regulatory hormones appear in increasing concentrations. Principle among these are glucagon, epinephrine, and growth hormone. All of these hormones stimulate liver (hepatic) glucose output, among other functions. For instance, both epinephrine and growth hormone also stimulate adipocyte lipase, which increases non-esterified fatty acid (NEFA) release. By oxidizing fatty acids, this spares glucose utilization and helps to maintain blood sugar level during exercise.
Exercise for diabetes: Exercise is a particularly potent tool for glucose control in those who have diabetes mellitus. In a situation of elevated blood glucose (hyperglycemia), moderate exercise can induce greater glucose disposal than appearance, thereby decreasing total plasma glucose concentrations. As stated above, the mechanism for this glucose disposal is independent of insulin, which makes it particularly well-suited for people with diabetes. In addition, there appears to be an increase in sensitivity to insulin for approximately 12–24 hours post-exercise. This is particularly useful for those who have type II diabetes and are producing sufficient insulin but demonstrate peripheral resistance to insulin signaling. However, during extreme hyperglycemic episodes, people with diabetes should avoid exercise due to potential complications associated with ketoacidosis. Exercise could exacerbate ketoacidosis by increasing ketone synthesis in response to increased circulating NEFA's.
Type II diabetes is also intricately linked to obesity, and there may be a connection between type II diabetes and how fat is stored within pancreatic, muscle, and liver cells. Likely due to this connection, weight loss from both exercise and diet tends to increase insulin sensitivity in the majority of people. In some people, this effect can be particularly potent and can result in normal glucose control. Although nobody is technically cured of diabetes, individuals can live normal lives without the fear of diabetic complications; however, regain of weight would assuredly result in diabetes signs and symptoms.

Yorum

Glikoz metabolizmasında sporun önemi belirgindir. Enerji temini için glikojenden şeker üretimi ile enerjinin adalede tüketilmesi yaklaşımı, temel kan şekerinin azalması değil, yükselmesi şeklinde de beklenti olabilir.

Oxygen
Vigorous physical activity (such as exercise or hard labor) increases the body's demand for oxygen. The first-line physiologic response to this demand is an increase in heart rate, breathing rate, and depth of breathing.
Oxygen consumption (VO_2) during exercise is best described by the Fick Equation: VO_2=Q x (a-vO_2diff), which states that the amount of oxygen consumed is equal to cardiac output (Q) multiplied by the difference between arterial and venous oxygen concentrations. More simply put, oxygen consumption is dictated by the quantity of blood distributed by the heart as well as the working muscle's ability to take up the oxygen within that blood; however, this is a bit of an oversimplification. Although cardiac output is thought to be the limiting factor of this relationship in healthy individuals, it is not the only determinant of VO2 max. That is, factors such as the ability of the lung to oxygenate the blood must also be considered. Various pathologies and anomalies cause conditions such as diffusion limitation, ventilation/perfusion mismatch, and pulmonary shunts that can limit oxygenation of the blood and therefore oxygen distribution. In addition, the oxygen carrying capacity of the blood is also an important determinant of the equation. Oxygen carrying capacity is often the target of exercise (ergogenic aids) aids used in endurance sports to increase the volume percentage of red blood cells (hematocrit), such as through blood doping or the use of erythropoietin (EPO). Furthermore, peripheral oxygen uptake is reliant on a rerouting of blood flow from relatively inactive viscera to the working skeletal muscles, and within the skeletal muscle, capillary to muscle fiber ratio influences oxygen extraction.

Yorum

Burada tek başına oksijen değil, oksijen enerji aktarımı ile, elektron transportu sayesinde oluşan yaklaşımda, ATP sentezine olanak sağlamaktadır.

Dehydration
Dehydration refers both to hypohydration (dehydration induced prior to exercise) and to exercise-induced dehydration (dehydration that develops during exercise). The latter reduces aerobic endurance performance and results in increased body temperature, heart rate, perceived exertion, and possibly increased reliance on carbohydrate as a fuel source. Although the negative effects of exercise-induced dehydration on exercise performance were clearly demonstrated in the 1940s, athletes continued to believe for years thereafter that fluid intake was not beneficial. More recently, negative effects on performance have been demonstrated with modest (<2%) dehydration, and these effects are exacerbated when the exercise is performed in a hot environment. The effects of hypohydration may vary, depending on whether it is induced through diuretics or sauna exposure, which substantially reduce plasma volume, or prior exercise, which has much less impact on plasma volume. Hypohydration reduces aerobic endurance, but its effects on muscle strength and endurance are not consistent and require further study.[11] Intense prolonged exercise produces metabolic waste heat, and this is removed by sweat-based thermoregulation. A male marathon runner loses each hour around 0.83 L in cool weather and 1.2 L in warm (losses in females are about 68 to 73% lower).[12] People doing heavy exercise may lose two and half times as much fluid in sweat as urine.[13] This can have profound physiological effects. Cycling for 2 hours in the heat (35 °C) with minimal fluid intake causes body mass decline by 3 to 5%, blood volume likewise by 3 to 6%, body temperature to rise constantly, and in comparison with proper fluid intake, higher heart rates, lower stroke volumes and cardiac outputs, reduced skin blood flow, and higher systemic vascular resistance. These effects are largely eliminated by replacing 50 to 80% of the fluid lost in sweat.[12][14]

Yorum

Spor yaparken en önemli boyut, dolaşım ile kanlanmanın adalede sağlanmasıdır. Burada kalp atımı kadar, damarsal yapı, venöz dolaşım ile kanın merkeze gelebilmesidir. Ayrıca karaciğerin laktik asiti metabolize edip, pirüvik asit ile yapılanması, kısaca Krebs döngüsü ile yıkılabilmesi beklenilmelidir.

Other

- Plasma catecholamine concentrations increase 10-fold in whole body exercise.[15]
- Ammonia is produced by exercised skeletal muscles from ADP (the precursor of ATP) by purine nucleotide deamination and amino acid catabolism of myofibrils.[16]
- interleukin-6 (IL-6) increases in blood circulation due to its release from working skeletal muscles.[17] This release is reduced if glucose is taken, suggesting it is related to energy depletion stresses.[18]
- Sodium absorption is affected by the release of interleukin-6 as this can cause the secretion of arginine vasopressin which, in turn, can lead to exercise-associated dangerously low sodium levels (hyponatremia). This loss of sodium in blood plasma can result in swelling of the brain. This can be prevented by awareness of the risk of drinking excessive amounts of fluids during prolonged exercise.[19][20]

Yorum

Spor ile birçok metabolik ürünler ortaya çıkmakta, bunların da etkileşimi gözlenmektedir.

Brain

At rest, the human brain receives 15% of total cardiac output, and uses 20% of the body's energy consumption.[21] The brain is normally dependent for its high energy expenditure upon aerobic metabolism. The brain as a result is highly sensitive to failure of its oxygen supply with loss of consciousness occurring within six to seven seconds,[22] with its EEG going flat in 23 seconds.[23] If it affected the oxygen and glucose supply to the brain, the metabolic demands of exercise could therefore quickly disrupt its functioning.

Protecting the brain from even minor disruption is important since exercise depends upon motor control, and particularly, because humans are bipeds, the motor control needed for keeping balance. Indeed, for this reason, brain energy consumption is increased during intense physical exercise due to the demands in the motor cognition needed to control the body.[24]

Cerebral oxygen

Cerebral autoregulation usually ensures the brain has priority to cardiac output, though this is impaired slightly by exhaustive exercise.[25] During submaximal exercise, cardiac output increases and cerebral blood flow increases beyond the brain's oxygen needs.[26] However, this is not the case for continuous maximal exertion: "Maximal exercise is, despite the increase in capillary oxygenation [in the brain], associated with a reduced mitochondrial O_2 content during whole body exercise"[27] The autoregulation of the brain's blood supply is impaired particularly in warm environments[28]

Glucose

In adults, exercise depletes the plasma glucose available to the brain: short intense exercise (35 min ergometer cycling) can reduce brain glucose uptake by 32%.[29]

At rest, energy for the adult brain is normally provided by glucose but the brain has a compensatory capacity to replace some of this with lactate. Research suggests that this can be raised, when a person rests in a brain scanner, to about 17%,[30] with a higher percentage of 25% occurring during hypoglycemia.[31] During intense exercise, lactate has been estimated to provide a third of the brain's energy needs.[29][32] There is evidence that the brain might, however, in spite of these alternative sources of energy, still suffer an energy crisis since IL-6 (a sign of metabolic stress) is released during exercise from the brain.[16][24]

Hyperthermia

Humans use sweat thermoregulation for body heat removal, particularly to remove the heat produced during exercise. Moderate dehydration as a consequence of exercise and heat is reported to impair cognition.[33][34] These impairments can start after body mass lost that is greater than 1%.[35] Cognitive impairment, particularly due to heat and exercise is likely to be due to loss of integrity to the blood brain barrier.[36] Hyperthermia also can lower cerebral blood flow,[37][38] and raise brain temperature.[24]

Yorum

Beyin enerjisini glikoz ile sağlarken, yeterli oksijenlenme olmaması durumunda, bilinç kaybı görülmektedir. Bu açıdan bilinç kaybı olmadan önce, laktik asitin adalede oluşturduğu veriler önemsenmelidir.

Fatigue

Intense activity

Researchers once attributed fatigue to a build-up of lactic acid in muscles.[39] However, this is no longer believed.[40][41] Rather, lactate may stop muscle fatigue by keeping muscles fully responding to nerve signals.[42] The available oxygen and energy supply, and disturbances of muscle ion homeostasis are the main factor determining exercise performance, at least during brief very intense exercise.

Each muscle contraction involves an action potential that activates voltage sensors, and so releases Ca^{2+} ions from the muscle fibre's sarcoplasmic reticulum. The action potentials that cause this require also ion changes: Na influxes during the depolarization phase and K effluxes for the repolarization phase. Cl^- ions also diffuse into the sarcoplasm to aid the repolarization phase. During intense muscle contraction, the ion pumps that maintain homeostasis of these ions are inactivated and this (with other ion related disruption) causes ionic disturbances. This causes cellular membrane depolarization, inexcitability, and so muscle weakness.[43] Ca^{2+} leakage from type 1 ryanodine receptor) channels has also been identified with fatigue.[44]

Yorum

Sporda kalsiyum ve elektrolitlerin doping etkisi olabileceği değerlendirilmeli ve kullanılmamalıdır. Vücudun dolaşım için yeterli sıvı alması önemlidir. Ancak spor yaparken alınacak sıvı ile bağırsakta yüksek oranda sıvı çekerek, özellikle beyin kanlanması önleyecektir. Bu açıdan spor yapanlar, yürüyenler, koşanların yanında su, elektrolitli su bulunmalı, bunu ancak yudumlayarak, 5mL geçmeyecek şekilde, içmelidirler. Bir şişe su içmeyi akıllarından geçirmemelidirler, vücudunda gereksinim olas bile yapmamalıdırlar.

Other factors
The exercise fatigue has also been suggested to be effected by:

- brain hyperthermia[53]
- glycogen depletion in brain cells[32][54]
- reactive oxygen species impairing skeletal muscle function[55]
- reduced level of glutamate secondary to uptake of ammonia in the brain[16]
- Fatigue in diaphragm and abdominal respiratory muscles limiting breathing[56]
- Impaired oxygen supply to muscles[57]
- Ammonia effects upon the brain[16]
- Serotonin pathways in the brain[58]
- Exercise Induced Asthma (EIA)narrowing of the airways in the lungs that is triggered by strenuous exercise. It causes shortness of breath, wheezing, coughing and other symptoms during or after exercise.The preferred term for this condition is exercise-induced bronchoconstriction (brong-koh-kun-STRIK-shun). This term is more accurate because the exercise induces narrowing of airways (bronchoconstriction) but is not the root cause of asthma. Among people with asthma, exercise is likely just one of several factors that can induce breathing difficulties.For most people with exercise-induced bronchoconstriction, treatment with common asthma medications and preventive measures enable them to exercise and remain active.[59]

Yorum

Bayılmanın çeşitli etkilerden de oluşabildiği dikkate alınmalıdır. Bireye oksijen vermek ile sorun çözülmeyeceği, bilakis nefes almanın baskılanacağı unutulmamalıdır.

Cardiac biomarkers

Prolonged exercise such as marathons can increase cardiac biomarkers such as troponin, B-type natriuretic peptide (BNP), and ischemia-modified (aka MI) albumin. This can be misinterpreted by medical personnel as signs of myocardial infarction, or cardiac dysfunction. In these clinical conditions, such cardiac biomarkers are produced by irreversible injury of muscles. In contrast, the processes that create them after strenuous exertion in endurance sports are reversible, with their levels returning to normal within 24-hours (further research, however, is still needed).[60][61][62]

Yorum

Kalp dokusu yanında, vücutta da olumsuz metabolitlerin oluşacağı dikkate alınmalıdır. Ancak uyaran laktik asit semptomları ile sınırlanma yapılmalıdır.

Human adaptations

Humans are specifically adapted to engage in prolonged strenuous muscular activity (such as efficient long distance bipedal running).[63] This capacity for endurance running evolved to allow the running down of game animals by persistent slow but constant chase over many hours.[64]
Central to the success of this is the ability of the human body, unlike that of the animals they hunt, to effectively remove muscle heat waste. In most animals, this is stored by allowing a temporary increase in body temperature. This allows them to escape from animals that quickly speed after them for a short duration (the way nearly all predators catch their prey). Humans, unlike other animals that catch prey, remove heat with a specialized thermoregulation based on sweat evaporation. One gram of sweat can remove 2,598 J of heat energy.[65] Another mechanism is increased skin blood flow during exercise that allows for greater convective heat loss that is aided by our upright posture. This skin based cooling has resulted in humans acquiring an increased number of sweat glands, combined with a lack of body fur that would otherwise stop air circulation and efficient evaporation.[66] Because humans can remove exercise heat, they can avoid the fatigue from heat exhaustion that affects animals chased in a persistent manner, and so eventually catch them.[67]

Yorum

Sporda adaptasyon ancak profesyoneller için dikkate alınmalıdır. Bireysel olarak, sağlıklı olmak temel olduğundan, uyarıcı etkilerden kurtulmak değil, onlara dikkat etmek gerekir.

Selective breeding experiments with rodents

Rodents have been specifically bred for exercise behavior or performance in several different studies.[68] For example, laboratory rats have been bred for high or low performance on a motorized treadmill with electrical stimulation as motivation.[69] The high-performance line of rats also exhibits increased voluntary wheel-running behavior as compared with the low-capacity line.[70] In an experimental evolution approach, four replicate lines of laboratory mice have been bred for high levels of voluntary exercise on wheels, while four additional control lines are maintained by breeding without regard to the amount of wheel running.[71] These selected lines of mice also show increased endurance capacity in tests of forced endurance capacity on a motorized treadmill.[72] However, in neither selection experiment have the precise causes of fatigue during either forced or voluntary exercise been determined.

Exercise-induced muscle pain

Physical exercise may cause pain both as an immediate effect that may result from stimulation of free nerve endings by low pH, as well as a delayed onset muscle soreness. The delayed soreness is fundamentally the result of ruptures within the muscle, although apparently not involving the rupture of whole muscle fibers.[73]
Muscle pain can range from a mild soreness to a debilitating injury depending on intensity of exercise, level of training, and other factors.[74]

Education in exercise physiology

Accreditation programs exist with professional bodies in most developed countries, ensuring the quality and consistency of education. In Canada, one may obtain the professional certification title – Certified Exercise Physiologist for those working with clients (both clinical and non clinical) in the health and fitness industry. An exercise physiologist's area of study may include but

is not limited to biochemistry, bioenergetics, cardiopulmonary function, hematology, biomechanics, skeletal muscle physiology, neuroendocrine function, and central and peripheral nervous system function. Furthermore, exercise physiologists range from basic scientists, to clinical researchers, to clinicians, to sports trainers.
Colleges and universities offer exercise physiology as a program of study on various different levels, including undergraduate, graduate, and doctoral programs. The basis of Exercise Physiology as a major is to prepare students for a career in field of health sciences. A program that focuses on the scientific study of the physiological processes involved in physical or motor activity, including sensorimotor interactions, response mechanisms, and the effects of injury, disease, and disability. Includes instruction in muscular and skeletal anatomy; molecular and cellular basis of muscle contraction; fuel utilization; neurophysiology of motor mechanics; systemic physiological responses (respiration, blood flow, endocrine secretions, and others); fatigue and exhaustion; muscle and body training; physiology of specific exercises and activities; physiology of injury; and the effects of disabilities and disease. Careers available with a degree in Exercise Physiology can include: non-clinical, client-based work; strength and conditioning specialists; cardiopulmonary treatment; and clinical-based research.[75]
In order to gauge the multiple areas of study, students are taught processes in which to follow on a client-based level. Practical and lecture teachings are instructed in the classroom and in a laboratory setting. These include:

- **Health and risk assessment**: In order to safely work with a client on the job, you must first be able to know the benefits and risks associated with physical activity. Examples of this include knowing specific injuries the body can experience during exercise, how to properly screen a client before their training begins, and what factors to look for that may inhibit their performance.
- **Exercise testing**: Coordinating exercise tests in order to measure body compositions, cardiorespiratory fitness, muscular strength/endurance, and flexibility. Functional tests are also used in order to gain understanding on a more specific part of the body. Once the information is gathered about a client, exercise physiologists must also be able to interpret the test data and decide what health-related outcomes have been discovered.
- **Exercise prescription**: Forming training programs that best meet an individuals health and fitness goals. Must be able to take into account different types of exercises, the reasons/goal for a clients workout, and pre-screened assessments. Knowing how to prescribe exercises for special considerations and populations is also required. These may include age differences, pregnancy, joint diseases, obesity, pulmonary disease, etc.[76]

Curriculum
The curriculum for exercise physiology includes biology, chemistry, and applied sciences. The purpose of the classes selected for this major is to have a proficient understanding of human anatomy, human physiology, and exercise physiology. Includes instruction in muscular and skeletal anatomy; molecular and cellular basis of muscle contraction; fuel utilization; neurophysiology of motor mechanics; systemic physiological responses (respiration, blood flow, endocrine secretions, and others); fatigue and exhaustion; muscle and body training; physiology of specific exercises and activities; physiology of injury; and the effects of disabilities and disease. Not only is a full class schedule needed to complete a degree in Exercise Physiology, but a minimum amount of practicum experience is required and internships are recommended.[77]

Yorum

Bir sporcu basit olarak laktik asit bulgularını öğrenmelidir. Madalya peşinde olabilecek, rekor kırabilecek sporcuların mutlaka Koçları olmalı, onların yönetilmesi gerekir. Bireysel olarak algılar ile yaklaşım yapılmamalıdır. Spor yine bireyin bedeni, adalenin yokluğu pahasına yapılamaz. Bir defa rekor kırmak değil, rekorunu geliştirmek önemsenmelidir.

3) Kinesiology (Wikipedia)

Kinesiology is the scientific study of human or non-human body movement. Kinesiology addresses physiological, biomechanical, and psychological mechanisms of movement. Applications of kinesiology to human health (i.e., **human kinesiology**) include biomechanics and orthopedics; strength and conditioning; sport psychology; methods of rehabilitation, such as physical and occupational therapy; and sport and exercise. Studies of human and animal motion include measures from motion tracking systems, electrophysiology of muscle and brain activity, various methods for monitoring physiological function, and other behavioral and cognitive research techniques.[1][2]
The word comes from the Greek κίνησις *kínēsis*, "movement" (itself from κινεῖν *kineîn*, "to move"), and -λογία *-logia*, "study".

Yorum

Bu yaklaşım, sporda Fizik Tedavi, Fizyoterapi, Tıbbi alet ve cihazların uygulanması, özürlülerin desteklenmesi, Ortopedi boyutlarında birey/hasta/sorunlu kişiler üzerine bir ekip olarak yaklaşım yapılmasını gerekli kılmaktadır. Kinetik, enerjinin gözlenmesi üzerinedir. Her birey göre özgündür.

Basics

Kinesiology is the study of human and nonhuman animal-body movements, performance, and function by applying the sciences of biomechanics, anatomy, physiology, psychology, and neuroscience. Applications of kinesiology in human-health include physical education teacher, rehabilitation, health and safety, health promotion, workplaces, sport and exercise industries. A bachelor's degree in kinesiology can provide strong preparation for graduate study in biomedical research, as well as in professional programs, such as medicine.
Whereas the term "kinesiologist" is neither a licensed nor professional designation in the United States nor most countries (with the exception of Canada), individuals with training in this area can teach physical education, provide consulting services, conduct research and develop policies related to rehabilitation, human motor performance, ergonomics, and occupational health and safety. In North America, kinesiologists may study to earn a Bachelor of Science, Master of Science, or Doctorate of Philosophy degree in Kinesiology or a Bachelor of Kinesiology degree, while in Australia or New Zealand, they are often conferred an Applied Science (Human Movement) degree (or higher). Many doctoral level faculty in North American kinesiology programs received their doctoral training in related disciplines, such as neuroscience, mechanical engineering, psychology, and physiology.

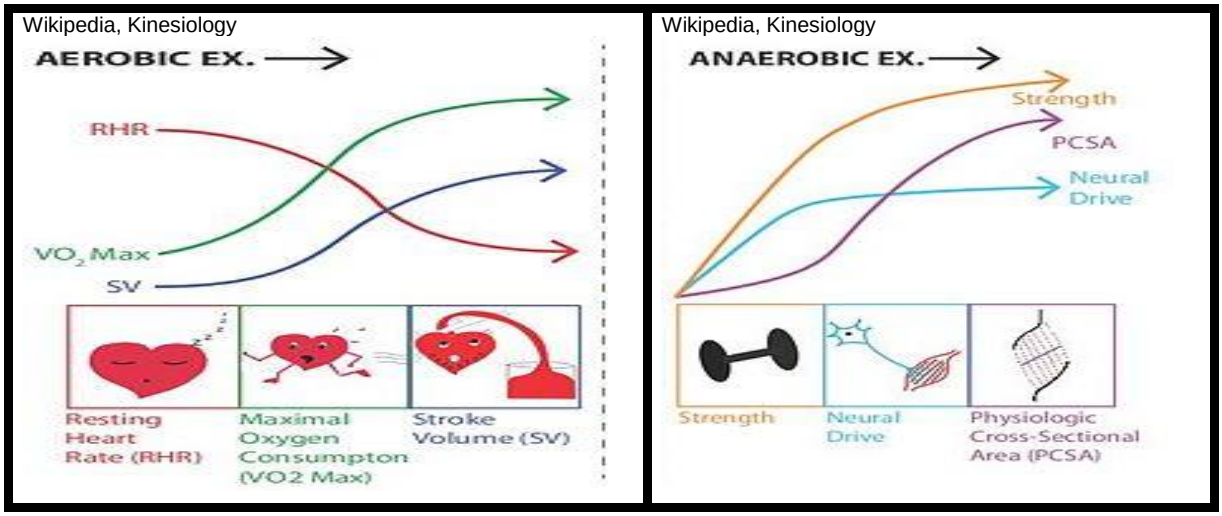
The world's first kinesiology department was launched in 1967 at the University of Waterloo, Canada.[3]

Yorum

Kinetik boyutu, biyomekanik, anatomi, fizyoloji, psikoloji, nörolojik bilim ile birlikte yukarıda da belirtildiği gibi, Fizik Tedavi, Fizyoterapi, Tıbbi alet ve cihazların insanlar üzerinde denenmesi, uygulanması, özürlülerin desteklenmesi, Ortopedi Bilim Dallarında kapsamı içinde olmalıdır.

Principles
Adaptation through exercise

Pratik yapma ile kazanılanlar



Şekil 8: Egzersiz yapılırken, aktif oksijenli ile glikoliz yöntemi ile de kazanımlar olmaktadır.

Summary of long-term adaptations to regular aerobic and anaerobic exercise. Aerobic exercise can cause several central cardiovascular adaptations, including an increase in stroke volume (SV)[4] and maximal aerobic capacity (VO_2 max),[4][5] as well as a decrease in resting heart rate (RHR).[6][7][8] Long-term adaptations to resistance training, the most common form of anaerobic exercise, include muscular hypertrophy,[9][10] an increase in the physiological cross-sectional area (PCSA) of muscle(s), and an increase in neural drive,[11][12] both of which lead to increased muscular strength.[13] Neural adaptations begin more quickly and plateau prior to the hypertrophic response.[14][15]
Adaptation through exercise is a key principle of kinesiology that relates to improved fitness in athletes as well as health and wellness in clinical populations. Exercise is a simple and established intervention for many movement disorders and musculoskeletal conditions due to the neuroplasticity of the brain[16] and the adaptability of the musculoskeletal system.[11][12][13] Therapeutic exercise has been shown to improve neuromotor control and motor capabilities in both normal[17] and pathological populations.[5][18]
There are many different types of exercise interventions that can be applied in kinesiology to athletic, normal, and clinical populations. Aerobic exercise interventions help to improve cardiovascular endurance.[19] Anaerobic strength training programs can increase muscular strength,[12] power,[20] and lean body mass.[21] Decreased risk of falls and increased neuromuscular control can be attributed to balance intervention programs.[22] Flexibility programs can increase functional range of motion and reduce the risk of injury.[23]
As a whole, exercise programs can reduce symptoms of depression[24] and risk of cardiovascular[25] and metabolic diseases.[26] Additionally, they can help to improve quality of life,[27] sleeping habits,[24] immune system function,[28] and body composition.[29]
The study of the physiological responses to physical exercise and their therapeutic applications is known as exercise physiology, which is an important area of research within kinesiology.

Yorum

Ne şekilde olursa olsun, adalelerin toparlanması, sağlıklı olmanın boyutu olarak spor yapılmalı, egzersiz gündeme gelmelidir.

Yatakta yatarken, adalelerin çalışılması, dizin kitlenmesi ve gevşetilmesi ile adaleler toplandırılır ve ayağa kalktığında yürüyebilir. Bir hafta yatan kimsenin yürümesi, dizini kitlenmesinin çok zor olacağı unutulmamalıdır.

Beden eğitimi, egzersizler rastgele, internetten indirilen plana göre yapılmamalıdır. Birçok uygulama bedene zarar verebilir, omurgayı zedeleyebilir. Mutlaka Beden Eğitimi ve Spor konusunda uzmanlaşmış kişilerden destek ve Koçluk alınmalıdır. Hekimlerin özellikle önerdikleri belirli süreç ve boyut olarak yapılmalıdır.

Neuroplasticity
Adaptive plasticity along with practice in three levels. In behavior level, performance (e.g., successful rate, accuracy) improved after practice.[30][31] In cortical level, motor representation areas of the acting muscles enlarged; functional connectivity between primary motor cortex (M1) and supplementary motor area (SMA) is strengthened.[32][33][34][35][36][37][38] In neuronal level, the number of dendrites and neurotransmitter increase with practice.[33][39][40]
Neuroplasticity is also a key scientific principle used in kinesiology to describe how movement and changes in the brain are related. The human brain adapts and acquires new motor skills based on this principle, which includes both adaptive and maladaptive brain changes.
Adaptive plasticity
Recent empirical evidence indicates the significant impact of physical activity on brain function; for example, greater amounts of physical activity are associated with enhanced cognitive function in older adults.[41] The effects of physical activity can be distributed throughout the whole brain, such as higher gray matter density and white matter integrity after exercise training,[42][43] and/or on specific brain areas, such as greater activation in prefrontal cortex and hippocampus.[44] Neuroplasticity is also the underlying mechanism of skill acquisition. For example, after long-term training, pianists showed greater gray matter density in sensorimotor cortex and white matter integrity in the internal capsule compared to non-musicians.[45][46]
Maladaptive plasticity
Maladaptive plasticity is defined as neuroplasticity with negative effects or detrimental consequences in behavior.[47][48] Movement abnormalities may occur among individuals with and without brain injuries due to abnormal remodeling in central nervous system.[35][49] Learned non-use is an example commonly seen among patients with brain damage, such as stroke. Patients with stroke learned to suppress paretic limb movement after unsuccessful experience in paretic hand use; this may cause decreased neuronal activation at adjacent areas of the infarcted motor cortex.[50][51]
There are many types of therapies that are designed to overcome maladaptive plasticity in clinic and research, such as constraint-induced movement therapy (CIMT), body weight support treadmill training (BWSTT) and virtual reality therapy. These interventions are shown to enhance motor function in paretic limbs [52][53][54] and stimulate cortical reorganization[55][56][57] in patients with brain damage.

Yorum

Spor sadece adale olarak değil, beyin gelişimi açısında da önemlidir. Oyun da insanların büyüme ve gelişmesinde katkısı vardır.

Sosyal ve etik açıdan da oyunlar, kuralları tanımlama, ilkeler boyutunda olma gibi özellikleri de kazandırmaktadır. Spor yaparken eğitim derecesi düşük olanlarda kavga fazla iken, yüksek öğretim yapanlarda, diplomalı değil, eğitimli olanlarda kavga daha az olmalıdır. Ancak kazanma üzerine olanların, kapasitesini ve becerisini başkasını mağlup etmek istemesi, onun diplomalı olsa bile, halen spor ile etik ve ahlaklı olmayı öğrenemediklerini göstermektedir.

Motor redundancy
Motor redundancy is a widely used concept in kinesiology and motor control which states that, for any task the human body can perform, there are effectively an unlimited number of ways the nervous system could achieve that task.[58] This redundancy appears at multiple levels in the chain of motor execution:

- Kinematic redundancy means that for a desired location of the endpoint (e.g. the hand or finger), there are many configurations of the joints that would produce the same endpoint location in space.
- Muscle redundancy means that the same net joint torque could be generated by many different relative contributions of individual muscles.
- Motor unit redundancy means that for the same net muscle force could be generated by many different relative contributions of motor units within that muscle.

The concept of motor redundancy is explored in numerous studies,[59][60][61] usually with the goal of describing the relative contribution of a set of motor elements (e.g. muscles) in various human movements, and how these contributions can be predicted from a comprehensive theory. Two distinct (but not incompatible) theories have emerged for how the nervous system coordinates redundant elements: **simplification** and **optimization**. In the simplification theory, complex movements and muscle actions are constructed from simpler ones, often known as primitives or synergies, resulting in a simpler system for the brain to control.[62][63] In the optimization theory, motor actions arise from the minimization of a control parameter,[61] such as the energetic cost of movement or errors in movement performance.[64]

Yorum

Bir insanın kavga etmesi, onun spor duygusundan yoksun olduğu anlamındadır. Kas gücünü öne çıkaran kişi aklı ve insanlığını ikinci plana itiyorsa, insanlık değil, gücü öne çıkaran hayvansal duyguları öne çıkmaktadır ki, bunlar ile iletişim ve ilişkide bulunmaktan kaçınmalıdır.

Gerçekten spor yapan, nazik, başkasına yardım eden ve adale gücünü sadece koruma ve etik ilkeleri gözetme için kullanandır. Bir zavallıyı döven, bir kadına, çocuğa el kaldıran, gerekçesi ne olursa olsun, özellikle eğitim, adam etme gibi etik dışı gerekçeleri sunanların, spor değil, adamlık unsurları da yok demektir.

Scope of practice

In Canada, kinesiology is a professional designation as well as an area of study.[65] In the province of Ontario the scope has been officially defined as, "the assessment of human movement and performance and its rehabilitation and management to maintain, rehabilitate or enhance movement and performance" [66]
Kinesiologists work in a variety of roles as health professionals. They work as rehabilitation providers in hospitals, clinics and private settings working with populations needing care for musculoskeletal, cardiac and neurological conditions. They provide rehabilitation to persons injured at work and in vehicular accidents. Kinesiologists also work as functional assessment specialists, exercise therapists, ergonomists, return to work specialists, case managers and medical legal evaluators. They can be found in hospital, long term care, clinic, work, and community settings.[67] Additionally, kinesiology is applied in areas of health and fitness for all levels of athletes, but more often found with training of elite athletes.

Yorum

Adale ile hareket etmenin anlamı, yatalak gibi bir haftadan fazla hasta olarak yattığınızda daha iyi anlayacak ve kavrayacaksınız.

Health service

- Health Promotion
  Kinesiologists working in the health promotion industry work with individuals to enhance the health, fitness, and well-being of the individual. Kinesiologists can be found working in fitness facilities, personal training/corporate wellness facilities, and industry.
- Clinical/Rehabilitation
  Kinesiologists work with individuals with disabling conditions to assist in regaining their optimal physical function. They work with individuals in their home, fitness facilities, rehabilitation clinics, and at the worksite. They also work alongside physiotherapists and occupational therapists.
- Ergonomics
  Kinesiologists work in industry to assess suitability of design of workstations and provide suggestions for modifications and assistive devices.
- Health and Safety.
  Kinesiologists are involved in consulting with industry to identify hazards and provide recommendations and solutions to optimize the health and safety of workers.
- Disability Management/Case Coordination
  Kinesiologists recommend and provide a plan of action to return an injured individual to their optimal function in all aspects of life.
- Management/Research/Administration/Health and Safety
  Kinesiologists frequently fulfill roles in all above areas, perform research, and manage businesses.[71]
- Health Education
  Kinesiologists working in health education teach people about behaviors that promote wellness. They develop and implement strategies to improve the health of individuals and communities. Community health workers collect data and discuss health concerns with members of specific populations or communities.[72]
- Athletic Training
  Kinesiologists working in athletic training work in cooperation with physicians. Athletic trainers strive to prevent athletes from suffering injuries, diagnose them if they have suffered an injury and apply the appropriate treatment.[73]
- Athletic Coaches and Scouts
  Kinesiologists who pursue a career as an athletic coach develop new talent and guide an athlete's progress in a specific sport. They teach amateur or professional athletes the skills they need to succeed at their sport. Many coaches are also involved in scouting. Scouts look for new players and evaluate their skills and likelihood for success at the college, amateur, or professional level.[74]
- Physical Education Teacher
  Kinesiologists working as physical education teachers are responsible for teaching fitness, sports and health. They help students stay both mentally and physically fit by teaching them to make healthy choices.[75]

Technology in Kinesiology

Motion capture technology has application in measuring human movement, and thus kinesiology. Historically, motion capture labs have recorded high fidelity data[84]. While accurate and credible, these systems can come at high capital and operational costs. Modern-day systems have increased accessibility to mocap technology[85].

Yorum

Hareket etmenin birçok boyutları sunulmaktadır; 1) sağlıklı olma açısından, 2) sağlıklı olmak için rehabilitasyon, 3) Ergonomiktir, oturma, bir eylem olarak cihazların boyutları açısından, 4) Sağlık ve güvenlik açısından, 5) özürlü ve engellilerin aktif olabilmeleri için, 6) sağlık eğitimi açısından, 7) atlet yetiştirmek için, 8) Koçluk, Mentorluk açısından, 9) Eğitici olarak bedensel hareketlere dikkat etmek, kinesiolojinin uygulama alanıdır.

Sonuç

Sağlık açısından adalelerin belirli düzeyde olması önemlidir. Bu nedenle aerobik, yürüme, bisiklet binilmesi, kondisyon bisikleti gibi tüm cihazlar bedensel, adalelerimizin güçlü olması, sağlıklı olmamız

için gereklidir. Tüm metabolizmalar da bu açıdan dengelenmesi de bu eylemleri yapmak gerekmektedir.

Burada standart, örnek alınacak numune, birey, insanın kendisidir. Kendi sınırına kadar gitmelidir. Sınırını çizen de adalelerdeki ağrı, sertlik ve yorgunluktur. Bunlar laktik asitin etkisidir.

Kısaca laktik asit oluşumu, bizlerin sınırını tanımlar. Laktik asit hem kaçındığımız hem de arzu ettiğimiz boyut olmaktadır. Bu sayede yapamayacak işe girmemekte, canımızı tehlikeye atmamış olacağız. Yürüyüş adalelerin ağrıması durumunda ara vermeyi gerekli kılar. İstirahat süresi de laktik asit metabolizma gücüne, yeteneğine göre olmaktadır.

Spor, belirli ilkeler içinde yapılmalıdır. Bu ilkeler Atatürk'ün tanımladığı şeklinde "***Ben sporcunun zeki, çevik ve ahlaklısını severim***" olarak belirtilebilir.