Castle View School

NCFE PE Reading Tasks

Year 10

2020/2021

Name…….

NCFE Health and Fitness Reading Contents

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The Human Skeletal System

By Kim Ann Zimmermann - Live Science Contributor August 08, 2019

Reference Article: Facts about the human skeletal system, its function and common skeletal diseases.

The human skeletal system is not quite as simple as the popular children's song suggests. The "head bone" (actually made up of 22 separate bones) is not connected to the "neck bone," but rather to a series of small bones that go all the way down the back. And the "toe bone" is actually made up of several bones that connect to another set of bones that provide structure for the foot. In total, the human skeleton consists of a whopping 206 bones.
In addition to all those bones, the human skeletal system includes a network of tendons, ligaments and cartilage that connect the bones together. The skeletal system provides the structural support for the human body and protects our organs. Our bones also serve several other vital functions, including producing blood cells and storing and releasing fats and minerals, according to the online textbook "Anatomy & Physiology" (BC Campus Open Textbooks).

Development and structure of the skeleton

Infants are born with about 300 separate bones, according to Nemours, a nonprofit children's health provider. As a child grows, some of those bones fuse together until growth stops, typically by the age of 25, leaving the skeleton with 206 bones.
Our bones are separated into two categories based on the purpose and location of the bones: The axial skeleton and the appendicular skeleton, according to "Anatomy & Physiology."
The axial skeleton contains 80 bones, including the skull, spine and rib cage. It forms the central structure of the skeleton, with the function of protecting the brain, spinal cord, heart and lungs.

The remaining 126 bones make up the appendicular skeleton; they include the arms, legs, shoulder girdle and pelvic girdle. The lower portion of the appendicular skeleton protects the major organs associated with digestion and reproduction and provides stability when a person is walking or running. The upper portion allows for a greater range of motion when lifting and carrying objects.

Bones are further classified by their shape: long, short, flat, irregular or sesamoid, according to "Anatomy & Physiology".

- Long bones are found in the arms, legs, fingers and toes. These bones are longer than they are wide and are cylindrical. They move when the muscles around them contract, and they are the most mobile parts of the skeleton.
- Short bones are found in the wrists and ankles and are about equal in their length, width and thickness.

- Flat bones make up the skull, shoulder blades, sternum and ribs. These curved, thin bones protect internal organs and provide an anchor for muscles.
- Irregular bones are those in the spinal cord and face, which, because of their unique dimension, don't fit in any of the other shape categories.
- Sesamoid bones are found in the hands, wrists, feet, ears and knees. These small, round bones are embedded in tendons and protect them from the great pressure and force they encounter.
  There are some variations between male and female skeletons. For example, the female pelvis is typically more broad, thin, and round than the male pelvis, according to "Anatomy & Physiology." [Image Gallery: The BioDigital Human]

What's inside your bones?

All about your body's skeleton, the framework of bones that keeps you together. (Image credit: Ross Toro, Livescience contributor)

Three main types of material make up every bone in your body: compact bone, spongy bone and bone marrow, according to the School of Life Sciences at Arizona State University.

Approximately 80% of every bone is compact bone, which is the hardest and strongest type of bone and is what allows the body to support its weight. Compact bone makes up the outer layers of the bone and protects the inner parts of the bones where many vital functions occur, such as bone marrow production. Compact bone consists primarily of cells called osteocytes. Microscopic passages in between the cells to allow nerves and blood vessels to pass through.

About 20% of each bone is spongy bone, which is filled with large holes and passages. Most often found toward the ends of individual bones, the spongy bone material is filled with bone marrow, nerves and blood vessels.

Two types of bone marrow fill the pores in spongy bone. Approximately half is red bone marrow, which is found mainly within flat bones such as shoulder blades and ribs. This is where all red and white blood cells and platelets (cells that help a cut stop bleeding) are made. Infant's bones contain all red bone marrow to produce enough blood cells to keep up with the youngsters' growth.

The other half of marrow is yellow bone marrow, which is found in long bones, such as thigh bones, and consists primarily of fat. Blood vessels run through both types of bone marrow to deliver nutrients and remove waste from the bones.

There are four main types of cells within bones: Osteoblasts, osteocytes, osteoclasts and lining cells.

Osteoblasts are cells that create new or repair existing bone material as the bones grow or break. The cells create a flexible material called osteoid and then fortify it with minerals to harden and strengthen it. When osteoblasts successfully finish their job, they retire to become osteocytes or lining cells.

Osteocytes, found in the compact bone, are responsible for exchanging minerals and communicating with other cells in the vicinity. They are formed from old osteoblasts that have gotten stuck in the center of bones.

Osteoclasts break down existing bone material and reabsorb it. These cells often work with osteoblasts to heal and reshape bone after a break (the osteoclasts break down the extra callus formed by the healing process) to make room for new blood vessels and nerves and to make bones thicker and stronger.

Lining cells are flat bone cells that completely cover the outside surface of bones. Their primary function is controlling the movement of minerals, cells and other materials into and out of the bones.

Diseases of the skeletal system

As with any part of the human body, bones are susceptible to injury and disease.

Some of the most common diseases that can affect the skeletal system include:

- Osteoporosis is a disease that causes the density and strength of bones to decrease because bone loss occurs faster than bone growth. It can be caused by genetics or unhealthy lifestyle habits (such as lack of calcium or vitamin D, and heavy smoking or drinking with little exercise).
- Leukemia is a type of cancer that starts in the bone marrow and the lymphatic system, according to the Mayo Clinic. Several types of leukemia affect various blood cells and other systems of the body.
- Osteoarthritis is a disease that causes the breakdown of the cartilage that protects the ends of bones in joints. This lack of cartilage leads to bone-on-bone rubbing, which can cause significant pain, damage to the bones and connective tissues, inflammation of the surrounding tissue and restricted motion, according to the Mayo Clinic.

Adult bones healthier when kids participate in organized sports

Linda Carroll
4 MIN READ

(Reuters Health) - Young adults who played in organized sports as children and teens have stronger bones than peers who were less active as kids, a new study suggests

Australian researchers found boys and girls who consistently participated in sports between the ages of 5 and 17 ended up with better bone density at age 20 than those who dropped out or never played, according to the results in the Journal of Bone and Mineral Research.

“Our study provides a strong rationale for the early and persistent encouragement of sports participation amongst children and adolescents in order to support primary prevention strategies for the prevention of osteoporosis and age-related fracture,” said lead author Joanne McVeigh of the School of Occupational Therapy, Speech Therapy and Social Work at Curtin University in Perth.

Why would sports participation help build strong bones?

“Bones respond to the loads placed on them,” McVeigh explained in an email. “There is convincing evidence that the growing skeleton has a better ability to respond to mechanical stresses - loads - than the adult skeleton does. Therefore being part of organized sport during these critical developmental periods allows for optimal bone

acquisition, leading to higher bone mass in young adulthood, and later life."

To determine what impact childhood sports might have on later bone health, McVeigh and her colleagues studied 984 children born in Perth hospitals between May 1989 and November 1991.

Information on sports participation from age 5 was supplied by parents. Bone density was measured with a whole-body dual energy X-ray absorptiometry (DEXA or DXA scan) when the participating kids were 20 years old. The researchers also made numerous other measurements, including height, weight and blood vitamin D levels, and asked the 20-year-olds for information on lifestyle, including alcohol consumption and smoking.

After adjusting for these and other factors, the researchers found that sports participation made a significant difference in bone density at age 20 for both women and men. For men, whole-body bone density was greater among those who played sports consistently since they were little kids, and leg bone density was greater even when boys only started participating in sports in the teen years.

For women, only those who consistently participated in sports since childhood had better bone density at age 20, and only in the legs.

The new study is a reminder that bone building is an important part of childhood, said Dr. Daniel Vigil of the David Geffen School of Medicine at the University of California, Los Angeles, who wasn't involved in the study.

“This is an important research study that demonstrates yet another important benefit of sports participation in children and adolescents,” Vigil said in an email. “We have known for decades about the benefits to bone health of exercise in adults. This study shows a benefit that is perhaps more important. The reason this study’s finding of benefit might be more important is the fact that people build the majority of their bone mass during adolescence - before age 20.”

So, bone density works like a bank account. Up to a certain age you can make deposits, but after that, you’re either holding steady or withdrawing.

“In other words, once we reach adulthood, we each have all the bone mass we will ever acquire,” Vigil said. “Therefore, whatever we can do before age 20 to strengthen our bones is of tremendous benefit. Along with adequate calcium and vitamin D, exercise is in that recipe, according to this study.”

Can Low-Impact Sports Like Cycling Be Putting Your Bones at Risk?

Research has raised concerns that activities like cycling and swimming may put too little pressure on bones.

Credit...Jed Jacobsohn for The New York Times

By Gretchen Reynolds

Could competitive cyclists be putting their bone health at risk?

A disquieting new study of bone density in elite cyclists and runners suggests that the answer might be yes. The study found that the cyclists, both male and female, had thinner bones than the runners, even though all of the athletes were young, healthy and enviably fit, and many of the cyclists lifted weights.

The results underscore the divergent effects of various sports on our skeletons and also stir a little unease about the long-term impacts of pursuing low-impact exercise at the expense of more high-impact activities.

By and large, the available scientific evidence shows that physical activity is desirable and even necessary for bone health. Children who run, hop and play develop thicker, stronger bones than those who remain sedentary, as do teenagers and young adults who participate in sports involving sprinting and leaping.

Most scientists agree that these kinds of activities build skeletal strength by generating sudden, sharp forces that minutely bow or deform the affected bones. Such activities jump-start processes within the body that increase the number of bone cells and help to prepare those parts of the skeleton to withstand similar forces in the future.

Even middle-aged and older people, who once were thought to face inevitable thinning of their bones with age, can maintain strong skeletons if they are sufficiently active, recent studies show.

But which types of exercise bend bones in a desirable way — and which are too gentle — remains uncertain. Some past studies suggest that running generates enough force to remodel bone, while other experiments with runners conclude the opposite. Ditto with weight training. And multiple studies have raised concerns about negligible or even adverse effects from non — weight-bearing exercises, such as cycling and swimming, which put little pressure on bones.

In hopes of gaining more clarity about sports and bones, researchers at the Norwegian School of Sport Sciences and the Norwegian Olympic Training Center, in Oslo, decided to look closely at the skeletons of world-class, competitive cyclists and runners.

They focused on elite, full-time athletes in large part because the athletes' heavy training could be expected to amplify any impacts from and differences between the two sports.

They wound up recruiting 21 high-level runners and 19 road cyclists, men and women, most of them in their 20s and all of them lean, fit and with several years of intense competition behind them.

Editors' Picks

The athletes reported to a lab, where scientists measured their body composition, with particular focus on the density of their bones, both over all and in their lower spines and the tops of their femurs — portions of the skeleton that can indicate general bone health.

The researchers also asked the athletes about their training, health and calcium intake and whether they spent much time in the gym. The latter question was of particular interest to the researchers, since weight training often is recommended to athletes in sports like cycling to bulk up their bones, as well as their muscles.

The scientists then compared data. Some of the differences between athletes were substantial, if expected. The cyclists trained far more than the runners, for instance, averaging about 900 hours a year in the saddle, versus about 500 annual hours on the road or treadmills for the runners.

The cyclists also did more weight training, with most of them heading to the gym during their off-season for intense lifting. None of the runners did that.

The athletes in both sports consumed enough calcium to meet their expected daily requirements.

But they had noticeably different bones.

The cyclists, as a group, all had thinner bones than the runners, and more than half of them met medical criteria for low bone mineral density in some portion of their skeleton. One of the riders, a man, displayed clinical osteoporosis in his spine.

These results are potentially worrisome, says Oddbjorn Klomsten Andersen, a graduate student at the Norwegian School of Sport Sciences and a former national-team cyclist himself, who led the study, which was published in BMJ Open Sport & Exercise Medicine.

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“There are limited studies following young cyclists through their careers,” he says. “But studies in master cyclists demonstrate that a larger proportion of them have low bone mineral density or osteoporosis” than people who do not cycle.

This study cannot tell us, though, why cyclists’ bones might be thin, he adds. They could have been eating too little or sweating too much for ideal bone health. Both low calorie intake and high rates of calcium loss through sweating have been tied to bone loss in other studies.

More surprising, the cyclists’ heavy weight training seems not to have built much bone.

But, as Mr. Andersen points out, this was a one-time snapshot of the athletes’ health. It’s possible, he says, that weight training prevented even greater bone thinning.

It is also encouraging, he says, that the runners harbored relatively healthy bones, since some past studies have hinted that running might not stimulate bone building.

Over all, the study’s findings suggest that serious cyclists might want to consider at least sometimes branching out, Mr. Andersen says.

“I would generally recommend combining cycling with weight-bearing exercise to promote good bone health,” he says

10 Years On: the Effect of 5 Sports on Your Joints and Muscles

Images used: Shutterstock

8 MIN READ

Most of us who do sports are no strangers to the occasional sprains and strains. When they happen, we hope for the best and jump right back into action once the pain goes away.

While the occasional sports injury may not seem like a big deal now, they may actually be causing gradual and silent damage to your body. Brushing them aside repeatedly could put you at risk of developing more severe conditions in the future.

Here are 5 common sports you may be doing, and the effects that you may suffer 10 years on.

Soccer

Sprained ankles and hamstring injuries are but a rite of passage for all soccer players. But they may not be as harmless as they seem.

Spraining your ankle means that your ligaments are stretched or torn from the sudden and forceful turning of your ankle beyond what is normal. When ligaments are stretched, it may never return to its original shape. This means that your ankle is now less stable, putting you at higher risk of repeated sprains in future.

Also, ankle sprains do not affect just your ankle. They can lead to chronic stiffness, which has a substantial effect on the rest of your body. Your walking becomes compromised, and muscles in the leg and pelvis lose efficiency and strength. This can cause your lower back and hips to start hurting.

As for hamstring injuries? The usual cure for hamstring injuries is time. However, repeated hamstring injuries mean that more scar tissue will form, preventing your muscle from functioning healthily in the long run. For these, there is the option of platelet-rich plasma (PRP) injections to promote the healing of hamstring injuries that do not resolve with rest and gentle stretching.

Dance

The dancers among us know that dance is anything but graceful and poised. Some injuries not uncommon to dancers are spasms and dislocations.

Ballet dancers in particular would be no strangers to bunions, a deformity where the big toe leans towards the second toe. Moving on pointed toes and wearing shoes that squeeze the toes together increase the pressure on the big toe, causing the bunion to enlarge. In more serious cases, this could result in pain, discomfort and difficulty walking in the long term.

Spasms usually indicate that you have overworked your muscles. When they happen, you may find that your motion is limited, and that you experience pain. Spasms can also indicate that your muscle is starting to tear. If you don't give it time to heal, you could suffer from tendon strains and tears.

Dislocations of the knee caps, elbows, and shoulders are also unsurprising. Unfortunately, the area that we dislocate will become more susceptible to further dislocations in future. Older adults in particular should be more wary, as shoulder dislocations could tear your rotator cuff.

CrossFit

CrossFit is gaining a huge following worldwide and in Singapore. However, the high-intensity workout that targets multiple body parts mean that the risk of getting injured is higher. In particular, some conditions include rotator cuff tendonitis and Achilles tendinopathy.

All the heavy and repetitive lifting exercises can cause injury to the rotator cuff (a group of 4 muscles around the shoulder joint). While it puts your training plan on hold, it is necessary to give it time to heal. Physiotherapy is often required in conjunction with rest. Not giving the injury time to heal could result in dire consequences, such as a lifetime of restricted shoulder motion or tearing of the tendon.

Squats, box jumps and double unders are great workout moves, but the repetitive movements spell bad news for our Achilles tendon. Repeated eccentric stress is placed on it, causing pain, swelling and stiffness. If not managed, your Achilles tendon may even rupture. That is a condition that will put you out of action for a long time, and may even require surgery.

Golf

Think that golf must be a safe sport with low risk of injury? Think again. Golf, with its highly repetitive movements often cause pain to the elbows, neck,

wrists, back and even fingers. Back pains are common among us golfers as the swings we do place considerable pressure on our spine and muscles. This is notable with the follow-through phase of the swing where the back can assume a c-shaped position. This can cause minor strains in our backs that can easily end up as severe back injuries.

Our knees can suffer from doing this sport as well. For those of us who suffer from weak knees or arthritis, knee pain can occur from repeated strain. Extreme twisting forces from the swings can even result in us developing torn ligaments or meniscus tears.

Yoga

While yoga is commonly touted to be a sport that brings about healing, the improper or excessive practice of certain yoga poses may actually do more harm than good. For example, the downward dog pose that we so enjoy doing involves us putting pressure on our wrist at a slightly awkward angle. If this pose is practised repeatedly over a long span of time, it would cause repeated stress on our wrists, possibly leading to repetitive strain injury or a ligament tear.

In fact, those among us who have injured our wrists in the past should avoid doing such poses as further aggravation of the injury could result in joint degeneration of the wrist in future.

Doing shoulder stands, the plow pose or headstands also put an immense amount of pressure on our spine, potentially causing injury to our shoulders or neck. If sustained over a long period of time or if the technique is poor, it could cause a serious backbone or spinal disc problem.

Preventing long term risks from sports injuries

Does that mean that we should avoid doing all forms of sports? No. Most of these injuries are sustained as a result of improper technique or overuse. However, as long as we keep exercising, there is bound to be a risk of sustaining injuries at any point of time.

With early treatment and intervention, our doctor will be able to advise us on recovery plans so as to be able to prevent or minimise the long-term effects that may happen if the condition is not managed. Take ownership of your health and partner with your orthopaedic or sports physician to take the best care of your body, ensuring that the exercise you do benefits, rather than harms your body.

What are the main functions of the muscular system?

- How the muscular system works
- Main functions
- Fun facts
- Takeaway

The muscular system consists of various types of muscle that each play a crucial role in the function of the body.

Muscles allow a person to move, speak, and chew. They control heartbeat, breathing, and digestion. Other seemingly unrelated functions, including temperature regulation and vision, also rely on the muscular system.

Keep reading to discover much more about the muscular system and how it controls the body.

How the muscular system works

The muscles account for around 40 percent of a person's weight with the largest muscle in the body being the gluteus maximus in the buttocks.

The muscular system contains more than 600 muscles that work together to enable the full functioning of the body.

There are 3 types of muscles in the body:

Skeletal muscle

Skeletal muscles are the only muscles that can be consciously controlled. They are attached to bones, and contracting the muscles causes movement of those bones.

Any action that a person consciously undertakes involves the use of skeletal muscles. Examples of such activities include running, chewing, and writing.

Smooth muscle

Smooth muscle lines the inside of blood vessels and organs, such as the stomach, and is also known as visceral muscle.

It is the weakest type of muscle but has an essential role in moving food along the digestive tract and maintaining blood circulation through the blood vessels.

Smooth muscle acts involuntarily and cannot be consciously controlled.

Cardiac muscle

Located only in the heart, cardiac muscle pumps blood around the body. Cardiac muscle stimulates its own contractions that form our heartbeat. Signals from the nervous system control the rate of contraction. This type of muscle is strong and acts involuntarily.

Eleven main functions of the muscular system

The main functions of the muscular system are as follows:

1. Mobility

The muscular system’s main function is to allow movement. When muscles contract, they contribute to gross and fine movement.

Gross movement refers to large, coordinated motions and includes:

- walking
- running
- swimming

Fine movement involves smaller movements, such as:

- writing
- speaking
- facial expressions

The smaller skeletal muscles are usually responsible for this type of action.

Most muscle movement of the body is under conscious control. However, some movements are reflexive, such as withdrawing a hand from a source of heat.

2. Stability

Muscle tendons stretch over joints and contribute to joint stability. Muscle tendons in the knee joint and the shoulder joint are crucial in stabilization.

The core muscles are those in the abdomen, back, and pelvis, and they also stabilize the body and assist in tasks, such as lifting weights.

3. Posture

Skeletal muscles help keep the body in the correct position when someone is sitting or standing. This is known as posture.

Good posture relies on strong, flexible muscles. Stiff, weak, or tight muscles contribute to poor posture and misalignment of the body.

Long-term, bad posture leads to joint and muscle pain in the shoulders, back, neck, and elsewhere.

4. Circulation

The heart is a muscle that pumps blood throughout the body. The movement of the heart is outside of conscious control, and it contracts automatically when stimulated by electrical signals.

Smooth muscle in the arteries and veins plays a further role in the circulation of blood around the body. These muscles maintain blood pressure and circulation in the event of blood loss or dehydration.

They expand to increase blood flow during times of intense exercise when the body requires more oxygen.

5. Respiration

Breathing involves the use of the diaphragm muscle.

The diaphragm is a dome-shaped muscle located below the lungs. When the diaphragm contracts, it pushes downward, causing the chest cavity to

get bigger. The lungs then fill with air. When the diaphragm muscle relaxes, it pushes air out of the lungs.

When someone wants to breath more deeply, it requires help from other muscles, including those in the abdomen, back, and neck.

6. Digestion

The muscular system allows for movement within the body, for example, during digestion or urination.

Smooth muscles in the gastrointestinal or GI tract control digestion. The GI tract stretches from the mouth to the anus.

Food moves through the digestive system with a wave-like motion called peristalsis. Muscles in the walls of the hollow organs contract and relax to cause this movement, which pushes food through the esophagus into the stomach.

The upper muscle in the stomach relaxes to allow food to enter, while the lower muscles mix food particles with stomach acid and enzymes.

The digested food moves from the stomach to the intestines by peristalsis. From here, more muscles contract to pass the food out of the body as stool.

7. Urination

The urinary system comprises both smooth and skeletal muscles, including those in the:

- bladder
- kidneys
- penis or vagina

- prostate
- ureters
- urethra

The muscles and nerves must work together to hold and release urine from the bladder.

Urinary problems, such as poor bladder control or retention of urine, are caused by damage to the nerves that carry signals to the muscles.

8. Childbirth

Smooth muscles in the uterus expand and contract during childbirth. These movements push the baby through the vagina. Also, the pelvic floor muscles help to guide the baby's head down the birth canal.

9. Vision

Six skeletal muscles around the eye control its movements. These muscles work quickly and precisely, and allow the eye to:

- maintain a stable image
- scan the surrounding area
- track moving objects

If someone experiences damage to their eye muscles, it can impair their vision.

10. Organ protection

Muscles in the torso protect the internal organs at the front, sides, and back of the body. The bones of the spine and the ribs provide further protection.

Muscles also protect the bones and organs by absorbing shock and reducing friction in the joints.

11. Temperature regulation

Maintaining normal body temperature is an important function of the muscular system. Almost 85 percent of the heat a person generates in their body comes from contracting muscles.

When body heat falls below optimal levels, the skeletal muscles increase their activity to make heat. Shivering is one example of this mechanism. Muscles in the blood vessels also contract to maintain body heat.

Body temperature can be brought back within normal range through the relaxation of smooth muscle in the blood vessels. This action increases blood flow and releases excess heat through the skin.

Respiratory system

The respiratory system transports oxygen from the air we breathe, through a system of tubes, into our lungs and then diffuses it into the bloodstream, whilst carbon dioxide makes the opposite journey.

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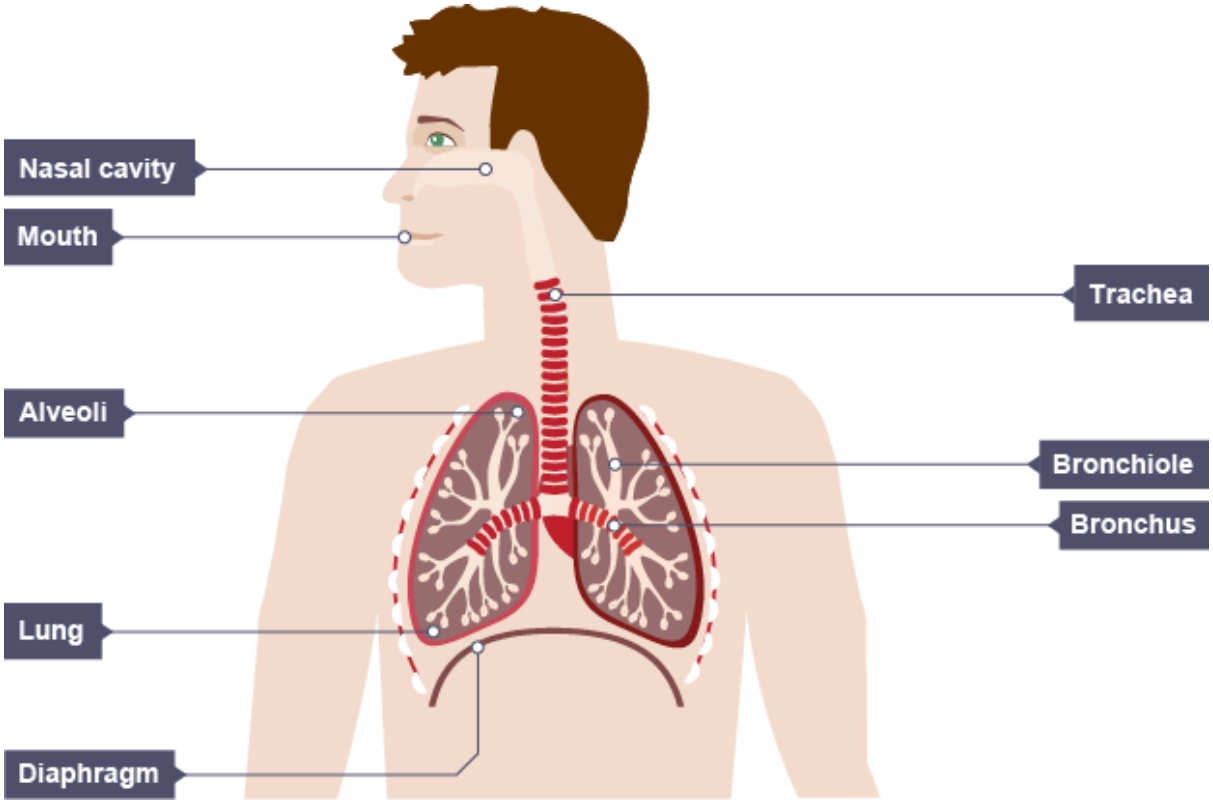
2.

Structure of the respiratory system

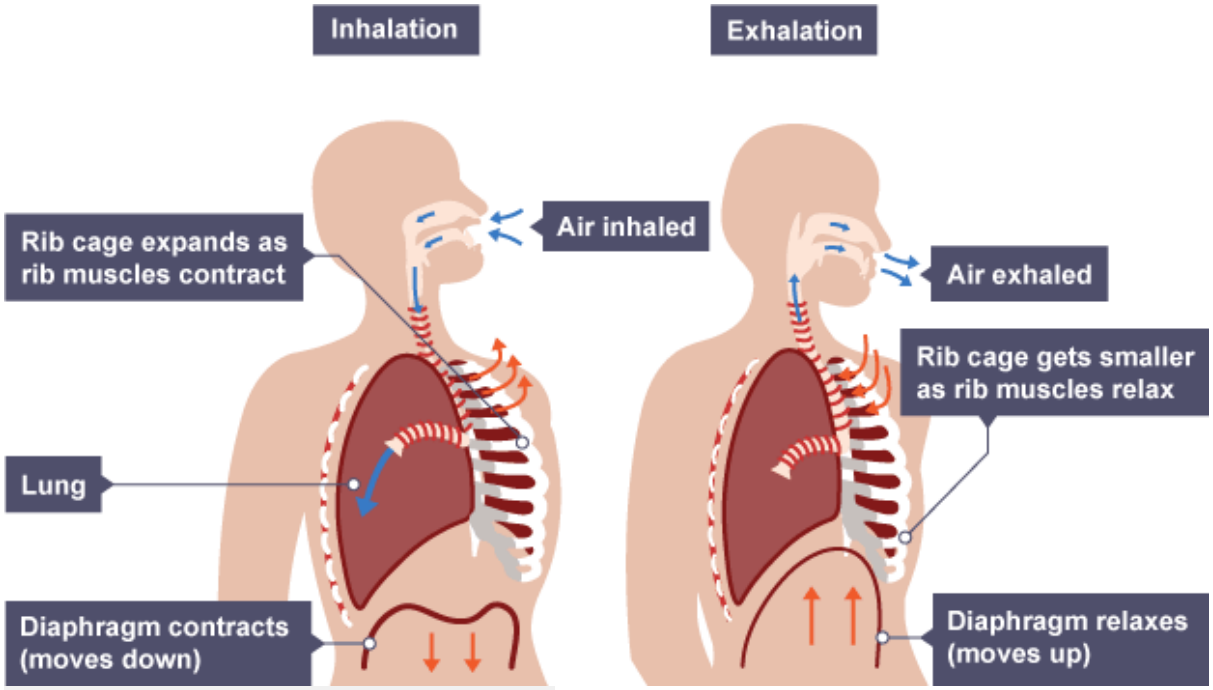


Passage of air into the lungs

1. Air enters the body and is warmed as it travels through the mouth and nose.
2. It then enters the trachea.
3. The trachea divides into two bronchi. One bronchus enters each lung.
4. Each bronchus branches out into smaller tubes called bronchioles. Air travels through these bronchioles.
5. At the end of the bronchioles, the air enters one of the many millions of alveoli where gaseous exchange takes place.

Breathing

Breathing is the term given to the process of taking air into and out of the lungs.



The process of inhalation and exhalation

Two important structures for breathing are the **diaphragm** and **intercostal muscles**.

The diaphragm is a sheet of muscle that separates the chest (or thoracic) cavity from the rest of the body.

The intercostal muscles are found between the ribs and they control rib movement.

Inspiration (breathing in)

The diaphragm contracts and moves downwards. The intercostal muscles contract and move the ribs upwards and outwards. This increases the size of the chest and decreases the air pressure inside it which sucks air into the lungs.

Expiration (breathing out)

The diaphragm relaxes and moves back to its domed shape. The intercostal muscles relax so the ribs move inwards and downwards under their own weight. This decreases the size of the chest and increases the air pressure in the chest so air is forced out of the lungs.

Composition of the air we breathe

Breathed in	Breathed out
21% oxygen	16% oxygen
0.03% carbon dioxide	4% carbon dioxide

The human body is designed to take in oxygen and to remove carbon dioxide. The respiratory system, in combination with the cardiovascular system, is responsible for providing this function.

Gas exchange

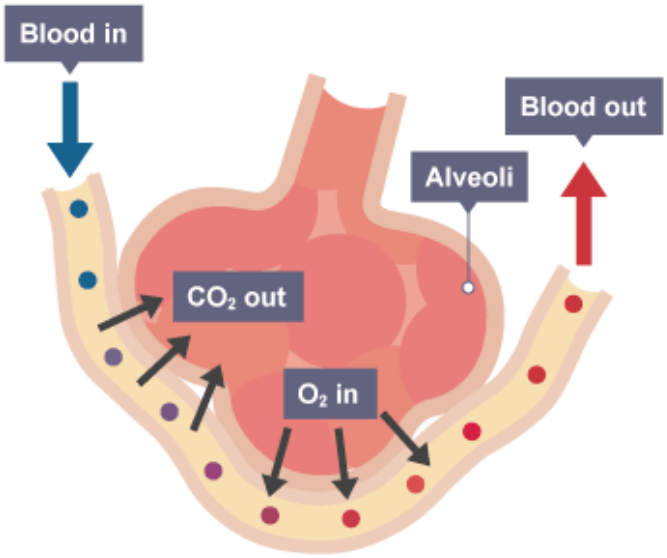
Gas exchange occurs at the alveoli in the lungs and takes place by diffusion. The alveoli are surrounded by capillaries so oxygen and carbon dioxide diffuse between the air in the alveoli and the blood in the capillaries.

Diffusion is the movement of gas from an area of high concentration to an area of low concentration.

There is a high concentration of oxygen in the alveoli and a low concentration of oxygen in the blood, so oxygen diffuses from the alveoli into the blood.

There is a high concentration of carbon dioxide in the blood and a low concentration in the alveoli, so carbon dioxide diffuses from the blood into the alveoli.

Both oxygen and carbon dioxide are capable of combining with an iron-rich protein in the blood called haemoglobin. Haemoglobin carries oxygen to be exchanged at the working muscle and carbon dioxide to be exchanged at the lung.



As the blood moves through the capillaries in the alveoli, oxygen diffuses into it and carbon dioxide diffuses out of it

Capillaries surround the alveoli in the lungs. Both the capillaries and alveoli walls are very thin - just one cell thick. They are made of semi-permeable membranes which allow oxygen and carbon dioxide to pass through them.

The Circulatory System: An Amazing Circuit That Keeps Our Bodies Going

By Kim Ann Zimmermann - Live Science Contributor August 08, 2019

Reference Article: Facts about the human circulatory system.

The human circulatory system keeps blood, oxygen and nutrients flowing through the body.
(Image: © Norman B/Shutterstock)

The circulatory system, also known as the cardiovascular system, is a vast network of organs and blood vessels that acts both as a delivery and waste removal system for the body. Nutrients, oxygen and hormones are delivered to every cell and as these necessities are provided, waste products such as carbon dioxide are removed, according to the nonprofit Nemours Children's Health System.
Not only does the circulatory system keep our cells healthy, but it also keeps us alive. The heart constantly receives signals from the rest of the body that direct how hard it needs to pump to properly supply the body with what it needs, according to Nemours. For example, when asleep, the body sends electrical signals to the heart that tell it to slow down. When participating in heavy exercise, the heart receives the message to pump harder to deliver extra oxygen to the muscles.

How the circulatory system works

The heart lies at the center of the circulatory system and pumps blood through the rest of the network. This hollow muscle is made up of four chambers: The left and right atriums make up the two chambers at the top and the left and right ventricles form the two chambers at the bottom, according to the University of Michigan. The chambers are separated by one-way valves to ensure that blood flows in the correct direction.
The rest of the circulatory system is made up of two independent networks that work together: The pulmonary and systemic systems.

The pulmonary system is responsible for providing fresh oxygen to the blood and removing carbon dioxide, according to the National Center for Biotechnology Information (NCBI). Oxygen-poor blood arrives from veins leading to the right atrium of the heart. The blood is then pumped through the right ventricle, then through the pulmonary artery, which splits off into two and divides into increasingly smaller arteries and capillaries before entering the lungs. The tiny capillaries form a network within the lungs that facilitate the exchange of carbon dioxide and oxygen. From the lungs, the oxygen-rich blood flows back toward the heart.
Next, the systemic system of arteries, veins and capillaries takes over. Arteries and veins are not the same, although they are both types of blood vessels. Arteries carry oxygen- and nutrient-rich blood from the heart to all parts of your body, according to the National Cancer Institute. Veins carry the oxygen- and nutrient-poor blood back to the heart. The capillaries are the smallest type of blood vessel, and provide the bridge between the arteries and veins.

Find out all about the blood, lungs and blood vessels that make up the circulatory system. (Image credit: Ross Toro, Livescience contributor)

As the oxygen-rich blood arrives from the lungs, it enters the left atrium and then travels through to the left ventricle before being pumped throughout the body, according to NCBI. The blood gets pumped through the aorta artery (the largest artery in the body) before entering the smaller arteries that carry the blood to every part of the body. As the blood delivers nutrients and oxygen to each cell, carbon dioxide and other waste products are picked up as the blood flows through the capillaries and into the veins.

The contraction and relaxation of the heart – the heartbeat – is controlled by the sinus node, which is a cluster of cells situated at the top of the right atrium. The sinus node sends electrical signals through the electrical conduction system of the heart that direct the muscle to contract or relax.

The heartbeat is divided into two phases: the systole and diastole phases. In the first, the ventricles contract and push blood out into the pulmonary artery or the aorta. At the same time, the valves separating the atria and ventricles snap shut to prevent blood from flowing backwards. In the diastole phase, the valves connecting to the atrium open, and the ventricles relax and fill with blood. The sinus node controls the pace of these two phases.

Adult humans have a total of about five to six quarts (a little less than five to six liters) of blood pumping through their bodies, according to Arkansas Heart Hospital. On average, the heart pumps about 100,000 times per day, pushing about 2,000 gallons (7,570 liters) of blood through a total of 60,000 miles (96,560 kilometers) of blood vessels. It only takes about 20 seconds for blood to travel through the entire circulatory system.

Circulatory system diseases

Heart disease is the leading cause of death for both men and women in the United States, claiming 610,000 people per year, according to the Centers for Disease Control and Prevention.

Heart disease is a broad term that covers a wide range of diseases and disorders, including stroke (the blockage of blood to the brain), heart attack (the flow of blood to the heart is blocked), hypertension (high blood pressure causing the heart to work harder), arteriosclerosis (the arteries become thick and stiff) and aneurysm (a damaged blood vessel that can lead to internal bleeding).

Risk factors for heart disease include age, sex, family history, poor diet, smoking and stress, as well as high blood pressure and elevated cholesterol levels, according to the Mayo Clinic. There are many ways that heart disease can be prevented, including keeping other health conditions under control, maintaining a healthy diet, participating in regular physical activity and keeping stress levels at a minimum

Aerobic and anaerobic exercise

Depending upon whether the body uses oxygen or not in order to perform physical activities determines if the activity is aerobic (with oxygen) or anaerobic (without oxygen).

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Anaerobic respiratory system

The anaerobic respiratory system supplies energy very quickly for sports such as vaulting in gymnastics or throwing a javelin where the activity only lasts a few seconds.

This system breaks down glucose into lactic acid. Glucose is derived from carbohydrates. It produces energy very quickly.

Glucose → energy + lactic acid

Athletes showing signs of fatigue and pain towards the end of a 400 m race

The lactic acid energy system produces the majority of the energy for moderate to high intensity activities such as running 400 metres. However, lactic acid is a fatiguing by-product of this energy pathway and causes pain and discomfort in the working muscles. It is for this reason that the winner of a 400 m race is typically the athlete who slows down the least.

Aerobic respiratory system

The aerobic respiratory system is responsible for producing the majority of our energy while our bodies are at rest or taking part in low-intensity exercise for long periods of time such as jogging or long-distance cycling.

Glucose + oxygen → energy + water + carbon dioxide

Glucose from carbohydrates and fats supply the energy for the aerobic energy system and can supply energy for long periods of time.

Carbohydrate food sources include rice, bread, potatoes, bananas and energy drinks. Fat food sources include butter, oils, cheese, milk and nuts.

Long and short term effects of exercise

During exercise the body systems respond immediately to provide energy for the muscles to work. After regular and repeated exercise, these systems adapt to become more efficient.

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Short term effects of exercise on the body systems

When a person takes part in exercise the cardiovascular, respiratory, energy and muscular systems all work together to supply energy to the working muscles and remove waste products.

When the muscles start to work, they need more oxygen so the respiratory system responds by getting more oxygen into the lungs. The blood carries greater amounts of oxygen and the heart responds to pump more oxygenated blood around the body.

These effects are shown in the table:

	Short term effects of exercise
Cardiovascular system	Increase in stroke volume (SV); increase in heart rate (HR); increase in cardiac output (Q); increase in blood pressure (BP)
Respiratory system	Increase in breathing rate; increase in tidal volume
Cardio-respiratory system	Increase in oxygen uptake; increase in carbon dioxide removal
Energy system	Increase in lactate production
Muscular system	Increase in temperature of muscles; increased pliability; muscle fatigue

After exercising, the muscles need to rest, adapt and recover. There is a risk of injury if the body is not rested for long enough after exercise. This concept can be better understood by studying the **Principles of training**.

Long term effects of exercise on the body systems

Taking part in regular exercise or training around three times per week for six weeks will lead to adaptation of the body systems that are used or trained. This has the effect of increasing performance in that type of exercise or sport and is often beneficial to general health and everyday life.

Resistance training increases strength

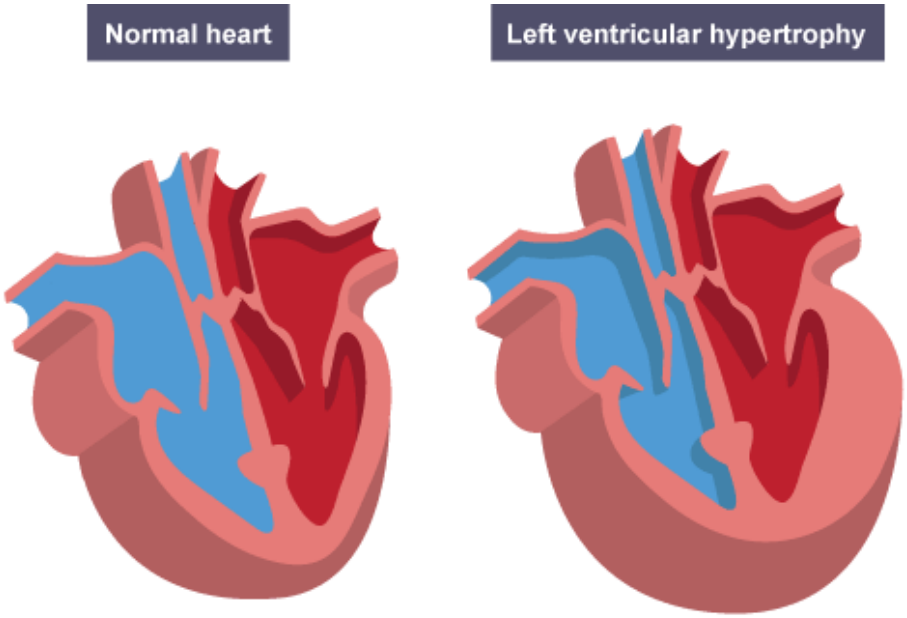
Aerobic training increases aerobic endurance

	Long term effects of exercise	Type of training
Cardiovascular system	Cardiac hypertrophy; increased stroke volume (SV); decrease in resting heart rate (HR); increase in maximum cardiac output (Q); capillarisation at the lungs and muscles; increase in number of red blood cells; increased size and strength of the heart; drop in resting blood pressure due to more elastic muscular wall of veins and arteries	Aerobic
Respiratory system	Increased vital capacity; increased number of functioning alveoli; increased strength of the respiratory muscles (internal and external intercostals and diaphragm); increased lung capacity and volume	Aerobic
Energy system	Increased production of energy from the aerobic energy system; increased tolerance to lactic acid	Aerobic; anaerobic

	Long term effects of exercise	Type of training
Muscular system	Muscle hypertrophy; increased strength of tendons; increased strength of ligaments	Resistance
Skeletal system	Increase in bone density	Resistance

Cardiac hypertrophy

Hypertrophy means an increase in size, so muscle hypertrophy means the muscles get bigger. If you weight train regularly doing biceps curls, your biceps will show muscle hypertrophy. Cardiac hypertrophy is where the ventricle wall gets larger or thickens as a result of exercise.



The muscle wall of the left ventricle increases in size, meaning it is able to pump out more blood during each contraction which increases the stroke volume. As **stroke volume** is **increased**, resting **heart rate decreases** but **cardiac output** (Q) **remains the same** as SV × HR = Q.

The 5 Health-Related Components of Fitness

Your blueprint for developing a healthy exercise routine

By
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Updated on April 03, 2020

You already know that benefits come when you prioritize physical fitness. The trick is understanding what, exactly, "fitness" is and how you can go about achieving it.

That's where the five components of fitness come in. They are the blueprint for the American College of Sports Medicine's (ACSM's) physical activity guidelines and serve as a helpful tool for organizing and executing your own well-balanced workout routine.[1]

The five components of fitness are:

- Cardiovascular endurance
- Muscular strength
- Muscular endurance
- Flexibility
- Body composition

Creating a fitness plan that incorporates each of these elements can help ensure that you get the most health benefits from your routine.

The Centers for Disease Control and Prevention (CDC) links regular physical activity to a reduced risk of cardiovascular disease, type 2 diabetes, some cancers, improved bone health, enhanced mental health, and improved quality of life with age.

Cardiovascular Endurance

Martin Novak / Getty Images

Cardiovascular endurance (also known as cardiorespiratory endurance or aerobic fitness) refers to your body's ability to efficiently and effectively intake oxygen and deliver it to your body's tissues by way of the heart, lungs, arteries, vessels, and veins. By engaging in regular exercise that challenges your heart and lungs, you can:

- Maintain or even improve the efficient delivery and uptake of oxygen to your body's systems
- Enhance cellular metabolism
- Ease the physical challenges of everyday life

Given that heart disease accounts for roughly 630,000 deaths in the United States each year, starting a workout program that enhances cardiovascular fitness is of particular importance.

Running, walking, cycling, swimming, dancing, circuit training, and boxing are just a few of the many workouts designed to benefit heart health.

The ACSM's physical activity guidelines call for at least 150 minutes of moderate-intensity exercise each week, or 75 minutes of vigorous exercise.

The key, of course, is consistency. It may sound like a lot, but 150 minutes breaks down to just 20 to 30 minutes of exercise per day, five to seven days a week, depending on how hard you push yourself.

Building Cardiovascular Endurance

Muscular Endurance

PeopleImages / Getty Images

Muscular endurance is one of two factors that contribute to overall muscular health. Think of muscular endurance as a particular muscle group's ability to continuously contract against a given resistance.

Long-distance cyclists offer a clear example. To continuously pedal a bike over a long distance, often up steep inclines, cyclists have to develop fatigue-resistant muscles in their legs and glutes. These are evidence of a high level of muscular endurance.

Likewise, holding a plank to develop core strength is another example of muscular endurance. The longer you're able to contract your abdominals and hold your body in a steady position, the greater endurance you have through your hips, abdominals, and shoulders.

The extent to which you choose to focus on muscular endurance should be directly related to your own health or fitness goals. It's important to realize that muscular endurance is muscle group-specific.

This means you can develop high levels of endurance in some muscle groups (like cyclists building endurance in their legs) without necessarily developing the same level of endurance in other muscle groups, depending on your needs.

For Everyday Health

For general health purposes, you may want to develop enough endurance to simply climb up several flights of stairs or to lift and carry groceries from your car to your house. Low-intensity weight-bearing or strength-training workouts will help you build up that endurance.

For Fitness-Related Goals

But if you want to become an endurance athlete capable of competing in sports that require continual muscle contraction, such as obstacle course races, CrossFit, or cycling, you may want to place a higher focus on training regimens that use high-repetition strength training and sport-specific activity to make you a better athlete.

Measuring and Improving Muscle Endurance

Muscular Strength

Caiaimage/Sam Edwards / Getty Images

While muscular endurance refers to how fatigue-resistant a particular muscle group is, muscular strength refers to the amount of force a particular muscle group can produce in one, all-out effort. In strength training terms, it's your one-rep max.

Like muscular endurance, muscular strength is muscle group-specific. In other words, you may have incredibly strong glutes, but comparatively weak deltoids; or incredibly strong pectoral muscles, but comparatively weak hamstrings. This is why a well-balanced strength training program that targets all of your major muscle groups is so important.

Consider Your Goals

The extent to which you train for strength is, again, determined by your own health and fitness goals. For instance, if your focus is on health, you know you should be strong enough to lift a heavy box or to easily stand up from a chair. In this circumstance, enhanced muscular strength may be a byproduct of a workout routine focused more on developing muscular endurance.

If, however, you want to develop muscle mass or to be able to lift heavier weights at the gym, your training regimen should be focused more on lifting heavy weights.

To Improve Muscle Strength

- Use heavier weights with fewer reps, taking your muscles to fatigue with each set.

To Improve Muscular Endurance

- Use lighter weights and higher rep counts to increase endurance over time.

It's possible to improve muscular strength and endurance at the same time. This can be done in conjunction with cardiovascular training. For instance, circuit-training routines that combine strength exercises and cardio into a single bout of training can make your exercise program more efficient.

The ACSM's guidelines state that adults should perform strength training exercises two to three days a week using a variety of exercises and equipment to target all the major muscle groups.

Flexibility

Hero Images / Getty Images

Flexibility refers to the range of motion you have around a given joint. Like muscular strength and endurance, flexibility is joint-specific. For instance, you may have very flexible shoulders, but tight and inflexible hamstrings or hips.

Flexibility is important at any age. It plays a role in unhindered movement and can affect your balance, coordination, and agility. Maintaining a full range of motion through your major joints can reduce the likelihood of injury and enhance athletic performance.

As you get older, the importance of flexibility becomes even clearer. Think of individuals who are elderly: Many may walk with a shuffle or have a hard time reaching their arms over their heads.

This may affect their quality of life, making it more challenging to perform activities of daily living, such as reaching items on high shelves, picking up items off the floor, or simply moving effectively to catch their balance if they start to fall.

While completely stopping the aging process isn't possible, protecting your joints and maintaining mobility can help keep you spry well into your later years.

The ACSM's physical activity guidelines call for adults to engage in flexibility exercises at least two or three days each week.

How to Increase Flexibility

There are simple ways you can work flexibility exercises into your day:

- Static stretching, where you hold a stretch for 10 to 30 seconds at a time
- Workouts that take you through dynamic stretching exercises, such as barre, yoga, Tai Chi, or Pilates
- Active stretching, such as lifting your leg up high and holding it there, uses the contraction of the opposing muscle to relax the muscle being stretched.
- Passive stretching, also called relaxed stretching, where you assume a stretch position and hold it with assistance of another part of your body, a partner, or apparatus, like a strap.
- Isometric stretching, a type of static stretching, uses resistance to alternate between relaxing and contracting the muscle.

How to Get the Most Benefits From Stretching

Body Composition

Body composition, or your body's ratio of fat mass to fat-free mass, is the final component of health-related physical fitness. Because high levels of fat mass are associated with negative health outcomes, such as heart disease and type 2 diabetes, attaining and maintaining a healthy body composition is a goal of just about all regular exercise routines.

Measuring Body Composition

To see improvements in body composition, you need to know what your starting point is. Weighing yourself on a scale won't do the trick, as weight alone tells you nothing about the makeup of your internal tissues.

Instead, talk to a trainer about having your body fat percentage tested, or consider purchasing a scale that uses bioelectrical impedance analysis (BIA) to estimate body fat percentage.

Hydrostatic testing is currently the gold-standard of measuring body composition. It involved being weighed on dry land followed by sitting on an underwater scale. The greater the fat composition, the lighter the underwater weight will be.

DEXA (dual-energy X-ray absorptiometry) scans, typically used for measuring bone mineral density and assessing for osteoporosis, can also be used to accurately measure body composition. DEXA scans are usually performed at radiology centers and may or may not be covered by insurance.

Though not as accurate as a DEXA scan or hydrostatic testing, you can also take your own measurements and plug them into a body fat percentage calculator. The results are estimates that typically fall within three to four percentage points of your actual body fat percentage, so it's important not to get too hung up on the specific numbers.

Learn Your Body Fat Percentage

About You

Male

Female

CALCULATE

EMBED THIS TOOL

Use results from body fat percentage calculators as a barometer to monitor changes and make sure you're seeing improvements over time.

Improving Body Composition

The good news is, improved body composition is often an outcome of working on and improving the other four components of fitness. If you're regularly hitting the gym, doing cardio, strength training, and working on flexibility, chances are you're developing muscle mass (fat-free mass) while reducing fat mass.

5 Skill Related Components of Physical Fitness

By **Mackenzie Maxwell**Updated **July 22, 2019**
Reviewed by **Aubrey Bailey, PT, DPT, CHT**

The main components of physical fitness are agility, balance, coordination, speed, and power.
Image Credit: Cecilie_Arcurs/E+/GettyImages

Fitness is more than skin deep. Rather than rely on looks and sizes, the skill-related components of fitness allow you to describe your physical fitness in terms of what you can do. Furthermore, skill-related fitness exercises can help you improve your performance in each area.

1. Agility Measures Ability to Adapt

According to the National Academy of Sports Medicine, this skill-related component measures your ability to change direction and position of your body without losing control. The quicker you can complete these tasks, the more agility you have. Skill-related fitness tests for agility may include running through courses with cones, for example.

If you want to improve your agility, the American College of Sports Medicine suggests trying a few drills:

- Battle ropes
- Quick feet up the stairs or bleachers
- Jumping rope
- Tossing a tennis ball against a wall and catching it

2. Balance for All Life Stages

Balance measures your ability to stay upright and in position, even in the face of obstacles. This remains one of the most important skill-related components of fitness in middle and advanced age. The Mayo Clinic reports that excellent balance can help prevent falls and fractures that endanger older adults. Even in childhood and early adulthood, balance is an important part of a healthy fitness routine and can improve core strength.

Yoga is one of the most popular skill-related fitness exercises for balance. People who do not want to try yoga or do not feel ready for that yet can try simpler balance exercises. For example, the Mayo Clinic recommends standing with one foot slightly raised for a few seconds, then switch feet.

3. Process and React With Coordination

Athletes with great coordination process visual information quickly and react accordingly with their hands and feet. For example, soccer players with excellent coordination can pass to one another seamlessly. Furthermore, basketball players use coordination to dribble, pass, and shoot.

Coordination skill-related fitness exercises include:

- Jumping rope
- Walk-and-talk catch
- Dribbling basketballs
- Contralateral marching

4. Speed for Every Sport

Speed is perhaps the most intuitive of the skill-related fitness components, as it measures how quickly you can complete certain tasks. One of the most common skill-related fitness tests for speed is to run and time sprints. However, you can also test your time on other tasks as well.

What type of speed you want to improve may depend on your favorite sport. For example, bicyclists and swimmers often want to increase their times in their specific sports. Furthermore, martial artists often work on increasing their hand speed to help them land more hits.

5. Power Measures Speed and Force

Power is the combination of your speed and strength during a given physical activity. Often, having lots of physical power means being able to generate lots of force quickly, even though you may only maintain that force for short bursts. For example, power runners do well in sprints and powerlifters have high one-rep maxes.

The infamous burpees and increasingly popular box jumps help improve power. Kettlebell exercises and heavy weightlifting can also help increase your power.

Bonus Skill: Reaction Time

If skill-related components of fitness were vowels, reaction time would be "y." While some fitness experts include reaction time as the sixth component, others include it with coordination. Regardless of its classification, reaction time is an important part of many athletic events.

This component measures how fast it takes for you to see or hear something and react appropriately. For example, a football receiver must see the pass coming his way and react quickly to successfully catch the

ball. Furthermore, martial artists must react to their opponents' acts instantaneously.

If you want to measure your fitness on something other than your appearance, be sure to focus on these important components. Improving these skills can also help you excel in your chosen sport and live healthily in old age.

Athletes

Mo Farah Training, Fitness and Diet

Mo Farah at the European Cross Country Championships, 2008

Mo's potential was spotted when he was 11 years-old by his PE teacher, Alan Watkinson, at Isleworth and Syon School in the London Borough of Hounslow. After seeing him run he knew immediately that Mo had the potential to compete at the highest level. This meeting changed Mo's life. Before he was encouraged to focus on athletics he was always getting into trouble at school. Mo Farrah is a Somali refugee and when he arrived in the UK at the age of 8 years old, he spoke very little English. He was always in fights in and out of school, until he found something to focus his energy on.

"I don't know what would have happened if he had not found athletics" ~ Alan Watkinson

When Mo was 13 year old he came 9th in the English schools cross country. In 2001, when he was 14 years old, he won the European Junior Championships. By the time Mo Farrah was 18 years old he was competing at a junior athlete level. He has since gone on to be British Champion, European Champion and World Champion over the 10,000 m. Today he hopes to win Olympic Gold in the 10,000m final at the London 2012 Games.

"I feel blessed to have him land on my doorstep" ~ Alan Watkinson

Their relationship went beyond that of a games teacher and pupil, Mr. Watkinson was best man at Mo's wedding.

Born to Run

Mo says that he was “born to run”. Running is natural to him, he was easily winning races at school without really making an effort. However, running was not something he aspired to do as a career.

He was not only good at running though, he won most athletic events at school including the javelin. However, running is what he really excelled at.

Mr. Watkinson spotted raw talent in Mo, plus the physcial attributes to make him a champion. Mo has a long stride length which makes him a more powerful runner – just in the same way that Usain Bolt’s longer stride makes him a faster sprinter.

Endurance Performance Centre

When he left school he won a place at the Endurance Performance Centre St Mary’s University College in Twickenham where he started to hone is raw talent into a professional skill. Mo still trains at St Mary’s when he is back in the UK.

Incidentally, St Mary’s University College is proud to announce that 8 athletes from its Endurance Performance and Coaching Centre are competing in the London 2012 Games.

Living With The Kenyans

Mo’s biggest breakthrough really came when he started living with a group of Kenyan’s long distance runners in 2006. While Mo was making excellent progress, he still viewed the Kenyans as untouchable. However, after living with them for a while he realised that his lifestyle was holding him back.

Mo used to stay up late, usually until 2am, and then rise late in the morning. His Kenyan house mates would go to bed at 9pm and be up by 6am to start training. He decided to adopt this approach too and soon started to discover new levels of energy and focus. This was when he started to believe in himself and knew that he could be more than just British Champion – he could compete internationally and win. Let’s take a look at the
Mo Farah training routine:

100 Miles a Week and Altitude Training

He started high altitude training around this time, going to Kenya. He would clock up 100 miles a week in training – averaging 14 miles a day. The result was that by 2012 his 5,000m and 10,000m times had improved significantly – he won both the 5,000m and 10,000m in the 2010 European Championships, and then broke David

Moorcroft's 28 year British record for the 5,000m, running it in 12:57.94 (Moorcroft ran it in 13:00.41 in 1982).

Mo has a few other little tricks up his sleeve too. Like the Brownlee brothers he also runs on an **underwater treadmill**. This helps to reduce impact damage while increasing resistance. He also uses a **cryogenic chamber** to aid muscle recovery. These are very similar to taking ice baths, but you can stay within the chamber for longer at colder temperatures. Cryogenic chambers can drop to minus 120 degrees Celsius. The goal is to reduce post-exercise inflammation so that the healing process can be more efficient.

Mo Farah Strength Training

TheGuardian reported that Mo's strength and conditioning coach David McHenry has taught him to do powerlifting as a key part of his strength training. Mo does heavy squats, uses kettlebells and performs excruciating core workouts. He can squat 200lb, 1.5 times his bodyweight, for 4-6 reps. He does gym work twice a week.

Alberto Salazar, who was Mo's coach in 2010, also introduced him to new strength exercises, and said: "The number one thing that has helped Mo is not the 110-miles a week he puts in on the road, but the seven hours a fortnight he does in the gym."

As well as weight lifting, he does boxing exercises to help build upper body endurance. This keeps his whole body balanced.

Mo Farah's Diet

Mo eats a lot of carbohydrates to fuel the muscles and also ensures that he gets a lot of protein straight after a workout. Endurance athletes need sugar and fast release sugar is also taken after a long workout as this prevents muscle wastage.

The Mo Farah diet consists of staples (carbohydrates) such as pasta, rice, potatoes and bread. Mo prefers pasta for fuel. It is still vital to get portion size correct though – too much can still lead to fat accumulation and this slows downs distance runners considerably.

For protein Mo likes to eat grilled chicken. Protein shakes are really not needed for distance runners as they get plenty of protein from a balanced diet. The key really is to eat very nutritious food all the time. After the London Games Closing Ceremony Mo Farah treated himself to one burger – the first he had eaten in months, maybe

over a year. And, just one. Then it was straight back to the healthy Mo Farah diet, as he has more competitions planned for the year.

Like all of today's great athletes, Mo Farrah's skill comes from a combination of natural talent, passion, focus, excellent coaching, a lot of training and simply making the right choices at the right time. Many people have the potential to be Olympic athletes, sometimes the biggest challenge is in spotting the raw talent and honing it into a world class skill.

Interested in running for fitness? Read our article on the Health Benefits of Jogging and Running.

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