

Physical fitness

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Physical fitness is a general state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Physical fitness is generally achieved through proper nutrition,^[1] moderate-vigorous physical exercise,^[2] and sufficient rest.^[3]

Before the industrial revolution, *fitness* was defined as the capacity to carry out the day's activities without undue fatigue. However, with automation and changes in lifestyles *physical fitness* is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations.^[4]



Physical fitness can be achieved through exercise. Photo shows Rich Froning Jr. – four-time winner of "Fittest Man on Earth" title.

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Fitness

Fitness is defined^[5] as the quality or state^[5] of being fit. Around 1950, perhaps consistent with the Industrial Revolution and the treatise of World War II, the term "fitness" increased in western vernacular by a factor of ten.^[6] Modern definition of fitness describe either a person or machine's ability to perform a specific function or a holistic definition of human adaptability to cope with various situations. This has led to an interrelation of human fitness and attractiveness which has mobilized global fitness and fitness equipment industries. Regarding specific function, fitness is attributed to person who possess significant aerobic or anaerobic ability,

i.e. strength or endurance. A holistic definition of fitness is described by Greg Glassman in the CrossFit journal as an increased work capacity across broad times and modal domains; mastery of several attributes of fitness including strength, endurance, power, speed, balance and coordination and being able to improve the amount of work done in a given time with any of these domains.^[7] A well rounded fitness program will improve a person in all aspects of fitness, rather than one, such as only cardio/respiratory endurance or only weight training.

A comprehensive fitness program tailored to an individual typically focuses on one or more specific skills,^[8] and on age-^[9] or health-related needs such as bone health.^[10] Many sources^[11] also cite mental, social and emotional health as an important part of overall fitness. This is often presented in textbooks as a triangle made up of three points, which represent physical, emotional, and mental fitness. Physical fitness can also prevent or treat many chronic health conditions brought on by unhealthy lifestyle or aging.^[12] Working out can also help some people sleep better and possibly alleviate some mood disorders in certain individuals.^[13]

Developing research has demonstrated that many of the benefits of exercise are mediated through the role of skeletal muscle as an endocrine organ. That is, contracting muscles release multiple substances known as myokines which promote the growth of new tissue, tissue repair, and various anti-inflammatory functions, which in turn reduce the risk of developing various inflammatory diseases.^[14]

Activity guidelines

The Physical Activity Guidelines for Americans was created by the Office of Disease Prevention and Health Promotion. This publication suggests that all adults should avoid inactivity to promote good health mentally and physically. For substantial health benefits, adults should participate in at least 150 minutes (two hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week. For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes (5 hours) a week of moderate-intensity, or 150 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity. Additional health benefits are gained by engaging in physical activity beyond this amount. Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.^[15]

Training

Specific or task-oriented fitness is a person's ability to perform in a specific activity with a reasonable efficiency: for example, sports or military service. Specific training prepares athletes to perform well in their



A woman performs plank exercise for strengthening of muscles



Fitness model posing with dumbbell

sport.

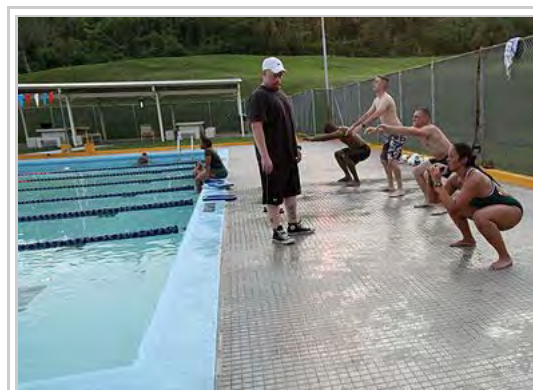
Examples are:

- 100 m sprint: in a sprint the athlete must be trained to work anaerobically throughout the race, an example of how to do this would be interval training.
- Middle distance running: athletes require both speed and endurance to gain benefit out of this training. The hard working muscles are at their peak for a longer period of time as they are being used at that level for longer period of time.^[16]
- Marathon: in this case the athlete must be trained to work aerobically and their endurance must be built-up to a maximum.
- Many fire fighters and police officers undergo regular fitness testing to determine if they are capable of the physically demanding tasks required of the job.^[17]
- Members of armed forces will often be required to pass a formal fitness test – for example soldiers of the US Army must be able to pass the Army Physical Fitness Test (APFT).^[18]
- Hill sprints: requires a level of fitness to begin with, the exercise is particularly good for the leg muscles. The army often trains doing mountain climbing and races.
- Plyometric and Isometric Exercises: An excellent way to build strength and increase muscular endurance.
- Sand running creates less strain on leg muscles than running on grass or concrete. This is because sand collapses beneath the foot softening the landing. Sand training is an effective way to lose weight and become fit as its proven you need more effort (one and a half times more) to run on the soft sand than on a hard surface.^[19]
- Aquajogging is a form of exercise that decreases strain on joints and bones. The water supplies minimal impact to muscles and bones which is good for those recovering from injury. Furthermore, the resistance of the water as one jogs through it provides an enhanced effect of exercise (the deeper you are the greater the force needed to pull your leg through).^[20]
- Swimming: Squatting exercise helps in enhancing a swimmer's start.^[21]

In order for physical fitness to benefit the health of an individual, an unknown response in the person called a stimulus will be triggered by the exertion. When exercise is performed with the correct amount of intensity, duration and frequency, a significant amount of improvement can occur. The person may overall feel better but the physical effects on the human body take weeks or months to notice and possibly years for full development. For training purposes, exercise must provide a stress or demand on either a function or tissue. To continue improvements, this demand must eventually increase little over an extended period of time. This sort of exercise training has three basic principles: overload, specificity, and progression. These principles are related to health but also enhancement of physical working capacity.^[22]

High Intensity Interval Training (HIIT)

High Intensity Interval Training consists of repeated, short bursts of exercise, completed at a high level of



Swimmers perform squats prior to entering the pool in a U.S. military base, 2011

intensity. These sets of intense activity are followed by a predetermined time of rest or low intensity activity.^[23] Studies have shown that exercising at a higher intensity has increased cardiac benefits for humans, compared to when exercising at a low or moderate level.^[24] When your workout consists of an HIIT session, your body has to work harder to replace the oxygen it lost. Research into the benefits of HIIT have revealed that it can be very successful for reducing fat, especially around the abdominal region. Furthermore, when compared to continuous moderate exercise, HIIT proves to burn more calories and increase the amount of fat burned post- HIIT session.^[25] Lack of time is one of the main reasons stated for not exercising; HIIT is a great alternative for those people because the duration of an HIIT session can be as short as 10 minutes, making it much quicker than conventional workouts.^[26]

Aerobic exercise

Cardiorespiratory fitness can be measured using VO₂ max, a measure of the amount of oxygen the body can uptake and utilize.^{[27][28]} Aerobic exercise, which improves cardiorespiratory fitness, involves movement that increases the heart rate to improve the body's oxygen consumption. This form of exercise is an important part of all training regiments ranging from professional athletes to the everyday person. Also, it helps increase stamina.

Examples are:

- Jogging – Running at a steady and gentle pace. This form of exercise is great for maintaining weight.
- Elliptical Training – This is a stationary exercise machine used to perform walking, or running without causing excessive stress on the joints. This form of exercise is perfect for people with achy hips, knees and ankles.
- Walking – Moving at a fairly regular pace for a short, medium or long distance.
- Treadmill training – Many treadmills have programs set up that offers a numerous amount of different workout plans. One effective cardiovascular activity would be to switch between running and walking. Typically warm up first by walking and then switch off between walking for three minutes and running for three minutes.
- Swimming – Using the arms and legs to keep oneself afloat and moving either forwards or backwards. This is a good full body exercise for those who are looking to strengthen their core while improving cardiovascular endurance.
- Cycling – Riding a bicycle typically involves longer distances than walking or jogging. This is another low stress exercise on the joints and is great for improving leg strength.^[29]

Effects

Controlling blood pressure

Physical fitness has proven to result in positive effects on the body's blood pressure because staying active and exercising regularly builds up a stronger heart. The heart is the main organ in charge of systolic blood pressure and diastolic blood pressure. Engaging in a physical activity will create a rise in blood pressure, once the activity is stopped, however, the individual's blood pressure will return to normal. The more physical activity that one engages in, the easier this process becomes, resulting in a more 'fit' individual.^[30] Through regular physical fitness, the heart does not have to work as hard to create a rise in blood pressure, which lowers the force on the arteries, and lowers the over all blood pressure.^[31]

Cancer prevention

Centers for disease control and prevention provide lifestyle guidelines of maintaining a balanced diet and engaging in physical activity to reduce the risk of disease. The WCRF/ American Institute for Cancer Research (AICR) published a list of recommendations that reflect the evidence they have found through consistency in fitness and dietary factors that directly relate to Cancer prevention.

The WCRF/AICR recommendations include the following:

- "Be as lean as possible without becoming underweight
- Each week, adults should engage in at least 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity
- Children should engage in at least one hour of moderate or vigorous physical activity each week
- Be physically active for at least thirty minutes every day
- Avoid sugar, limit the consumption of energy packed foods
- Balance your diet with a variety of vegetables, grains, fruits, legumes, etc.
- Limit sodium intake, the consumption of red meats and the consumption of processed meats
- Limit alcoholic drinks to two for men and one for women a day"^[32]

These recommendations are also widely supported by the American Cancer Society. The guidelines have been evaluated and individuals that have higher guideline adherence scores substantially reduce cancer risk as well as help towards control with a multitude of chronic health problems. Regular physical activity is a factor that helps reduce an individual's blood pressure and improves cholesterol levels, two key components that correlate with heart disease and Type 2 Diabetes.^[33] The American Cancer Society encourages the public to "adopt a physically active lifestyle" by meeting the criteria in a variety of physical activities such as hiking, swimming, circuit training, resistance training, lifting, etc. It is understood that cancer is not a disease that can be cured by physical fitness alone, however because it is a multifactorial disease, physical fitness is a controllable prevention. The large associations tied with being physically fit and reduced cancer risk are enough to provide a strategy to reduce cancer risk.^[32] The American Cancer Society asserts different levels of activity ranging from moderate to vigorous to clarify the recommended time spent on a physical activity. These classifications of physical activity consider the intentional exercise and basic activities done on a daily basis and give the public a greater understanding by what fitness levels suffice as future disease prevention.

Inflammation

Studies have shown an association between increased physical activity and reduced inflammation.^[34] It produces both a short-term inflammatory response and a long-term anti-inflammatory effect.^[35] Physical activity reduces inflammation in conjunction with or independent of changes in body weight.^[36] However, the mechanisms linking physical activity to inflammation are unknown.

Immune system

Physical activity boosts the immune system. This is dependent on the concentration of endogenous factors (such as sex hormones, metabolic hormones and growth hormones), body temperature, blood flow, hydration status and body position.^[37] Physical activity has shown to increase the levels of natural killer (NK) cells, NK T cells, macrophages, neutrophils and eosinophils, complements, cytokines, antibodies and T cytotoxic cells.^[38]^[39] However, the mechanism linking physical activity to immune system is not fully understood.

Cardiovascular disease prevention

Physical activity affects one's blood pressure, cholesterol levels, blood lipid levels, blood clotting factors and the strength of blood vessels. All factors that directly correlate to cardiovascular disease. It also improves the body's use of insulin. People who are at risk for diabetes, Type 2 (insulin resistant) especially, benefit greatly from physical activity because it activates a better usage of insulin and protects the heart. Those who develop diabetes have an increased risk of developing cardiovascular disease. In a study where a sample of around ten thousand adults from the Third National Health and Nutrition Examination Survey, physical activity and metabolic risk factors such as insulin resistance, inflammation, dyslipidemia were assessed. The study adjusted basic confounders with moderate/vigorous physical activity and the relation with CVD mortality. The results displayed physical activity being associated with a lower risk of CVD mortality that was independent of traditional metabolic risk factors.

The American Heart Association recommendations include the same findings as provided in the WCRF/ AICR recommendations list for people who are healthy. In regards to people with lower blood pressure or cholesterol, the association recommends that these individuals aim for around forty minutes of moderate to vigorous physical activity around three or four times a week.^[40]

Weight control

Achieving resilience through physical fitness promotes a vast and complex range of health related benefits. Individuals who keep up physical fitness levels generally regulate their distribution of body fat and stay away from obesity. Abdominal fat, specifically visceral fat, is most directly affected by engaging in aerobic exercise. Strength training has been known to increase the amount of muscle in the body, however it can also reduce body fat.^[41] Sex steroid hormones, insulin, and an appropriate immune response are factors that mediate metabolism in relation to the abdominal fat. Therefore, physical fitness provides weight control through regulation of these bodily functions.^[42]

Menopause and physical fitness

Menopause is the term that is used to refer to the stretch of both before and after a woman's last menstrual cycle. There are an instrumental amount of symptoms connected to menopause, most of which can affect the quality of life of the women involved in this stage of her life. One way to reduce the severity of the symptoms is exercise and keeping a healthy level of fitness. Prior to and during menopause as the female body changes there can be physical, physiological or internal changes to the body. These changes can be prevented or even reduced with the use of regular exercise. These changes include;^[43]

- Prevention of weight gain: around menopause women tend to experience a reduction in muscle mass and an increase in fat levels. Slight increases in physical exercise can help to prevent these changes.
- Reduce the risk of breast cancer: due to the weight loss from regular exercise may offer protection from breast cancer.
- Strengthen the bones: Physical activity can slow the bone loss associated with menopause, reducing the chance of bone fractures and osteoporosis.
- Reduce the risk of disease: Excess weight can increase the risk of heart disease and type 2 diabetes, and the regular physical activity can counter these effects.
- Boost the mood: By being involved in regular activities it can improve the psychological health, this can be the case at any age and not only for times during or after menopause.^[44]


The Melbourne Women's Midlife Health Project provided evidence that showed over an eight-year time period 438 were followed. Even though the physical activity was not associated with VMS in this cohort at the beginning. Women who reported they were physically active everyday at the beginning were 49% less likely to have reported bothersome hot flushes. This is in contrast to women whose level of activity decreased and were more likely to experience bothersome hot flushes.^[45]

See also

- Health
- Physical exercise
- Outline of exercise
- Personal trainer
- Fitness professional
- Bodybuilding

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