

# CARDIORESPIRATORY SYSTEM FOR LIFE



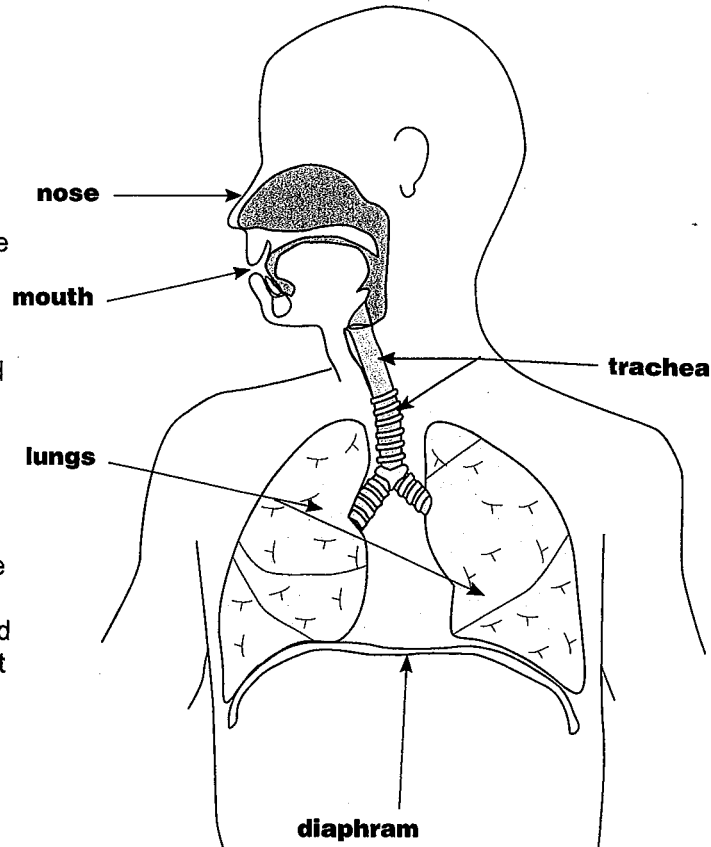
## STUDENT INTRODUCTION

The heart, blood, and blood vessels of the cardiovascular system and lungs of the respiratory system work together to provide necessary oxygen and nutrients to all cells of the body. When these two systems work to supply oxygen and nutrients to the muscles during long periods of physical activity, it is called **cardiorespiratory endurance**. Improving the function of the cardiovascular and respiratory systems, therefore, increases the level of cardiorespiratory endurance. This provides a person with the energy and stamina to enjoy a life full of movement improved health, performance and appearance.

With improved cardiorespiratory endurance, a person can reduce his/her risk of developing health problems such as heart attacks, strokes, high blood pressure, obesity, and Type 2 diabetes. Increasing cardiorespiratory endurance can also improve performance during physical activity, allowing a person to participate longer and take fewer and shorter breaks. People with low levels of cardiorespiratory endurance tend to tire quickly during physical activity. Appearance can also be improved through cardiorespiratory endurance training, due to the use of excess calories that would otherwise be stored as fat.

Activities that can be performed for long periods of time and that are continuous in nature can be used for cardiorespiratory endurance training. Jogging, jumping rope, swimming, hiking, power walking, skating and bicycling are a few examples of such activities. These activities can be done for long periods of time without taking breaks. To receive the benefits from cardiorespiratory endurance training, it is recommended that a person work at 65-85% of his/her maximum heart rate or an intensity level (RPE) of 4 and keep it there for at least 60 minutes on most days of the week. To understand how cardiorespiratory endurance improves health, performance, and appearance, it is necessary to understand basic knowledge of the respiratory, cardiovascular and muscular systems.

The **respiratory system** includes the nose, mouth, trachea, diaphragm, and lungs. During respiration or breathing, the **diaphragm**, a large dome-shaped muscle that separates the chest and abdomen, contracts. This allows oxygen to flow in through the nose and mouth, passing through the **trachea** (windpipe) and into the lungs. While in the lungs, an important exchange is made. Blood that is circulating around the lungs exchanges carbon dioxide for oxygen. As the diaphragm relaxes, carbon dioxide is then exhaled. With cardiorespiratory endurance training, the diaphragm will become stronger, enabling the lungs to expand further. As the lungs expand further, they allow a greater amount of oxygen into the lungs with each breath creating a more efficient respiratory system.



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## STUDENT INTRODUCTION

The **cardiovascular system** includes the heart, blood, and blood vessels, including arteries, capillaries, and veins. This is the system that is responsible for transporting blood, the ultimate delivery truck for all the cells in the body. It delivers life-saving, energy-producing oxygen to the cells and then picks up carbon dioxide and takes it away.

The heart, the pump that is responsible for circulating blood throughout the entire body, is the most important muscle in the body. When the heart beats, it pumps oxygen and nutrient rich blood through the arteries to all parts of the body. From these **arteries**, or small tubes or vessels for blood leaving the heart, the blood enters the capillaries. The **capillaries** are the smallest of the blood vessels, and are where the blood delivers oxygen to the cells and picks up carbon dioxide from the cells. The blood, de-oxygenated and waste filled, then flows into the **veins**, which are the vessels that transport blood back to the heart and then to the lungs to drop off carbon dioxide and pick up more oxygen. The oxygen rich blood then flows back to the heart where it is pumped out to the rest of the body, starting the whole process over.

The cardiovascular system is greatly improved through cardiorespiratory endurance training. Like all muscles, the heart becomes stronger with overload or more activity. As the heart becomes stronger, it is able to pump more blood with each beat. The heart can then beat at a slower rate during rest. When the body's demand for oxygen increases, the heart will have a greater reserve. Other improvements that occur as a result of cardiorespiratory endurance training are an increase in the number of capillaries around the muscles and lungs and an increase in the number of red blood cells. With more capillaries available to the muscles, and more oxygen carrying red blood cells in the blood, an increased amount of oxygen can be delivered. Increasing the number of capillaries around the lungs allows the blood to transfer carbon dioxide and oxygen more efficiently. Over time, with cardiorespiratory endurance training, the body makes these small adjustments which lead to great improvements in health, performance, and appearance.

When training to maintain or improve cardiorespiratory endurance, it is important to understand the two main energy systems of the muscular system. These energy systems are the anaerobic system and the aerobic system. **Anaerobic** means without oxygen, while **aerobic** means with oxygen. The muscles can use each of these systems to meet the demands that are placed upon them for movement. The anaerobic system is used for short bursts of power and speed, and the aerobic system is used for long steady journeys.

The anaerobic system, being the more powerful of the two systems, can create the greatest amount of force and is the first energy system that is called upon. For example, in an emergency a person might need to run from a dangerous situation. The anaerobic system will use stored chemicals in the muscles to produce movement and the person will be able to run very fast. The muscles, however, have a limited supply of these stored chemicals. When the muscles use up these stored chemicals they will no longer be able to perform with as much power, and the person will have to slow down or stop.

As the muscles begin to receive more oxygen from the heart and lungs, they switch gears and begin to use the **aerobic** system to produce energy for movement. With the increased oxygen level in the muscles, fat can then be used as the energy source for movement. While using the **aerobic** system, a person can perform activities for longer periods of time even though he/she cannot run as fast, jump as high, or move with as much power as they can while using the **anaerobic** system. If the activity becomes too vigorous, however, the heart and lungs will not be able to supply enough oxygen to the muscles involved and they will tire reverting back to the anaerobic system.

Cardiorespiratory endurance training increases the ability of the lungs to take in more oxygen and the ability of the cardiovascular system to deliver more oxygen to cells of the body. It also allows the muscles to become better at taking and using oxygen from the blood and more efficient at using fat as an energy source.

These improvements in the systems of the body all lead to remarkable improvements in health, performance and appearance.

Key vocabulary words that will be introduced during this unit are:

- **Aerobic** – Energy producing system within the muscle that requires oxygen
- **Anaerobic** – Energy producing system within the muscle that is without oxygen
- **Arteries** – Small tubes or vessels for blood leaving the heart
- **Capillaries** – Smallest of the blood vessels and the place where tissues of the body exchange carbon dioxide in exchange for oxygen
- **Cardiorespiratory Endurance** – The ability of the heart, blood, blood vessels and lungs to supply oxygen to the muscles during long periods of physical activity
- **Cardiovascular System** – The network of blood vessels and the heart that pumps blood throughout the body. Includes the heart, blood and blood vessels, including arteries, capillaries and veins
- **Diaphragm** – a large dome-shaped muscle that separates the chest and abdomen
- **Muscular System** – A complicated system of 650 muscles that coordinates and produces movement by shortening and lengthening muscles
- **Respiratory system** – The passageways, muscles, and lungs that allow oxygen to be breathed in (inhaled) and carbon dioxide to be breathed out (exhaled)
- **Trachea** – Part of the respiratory system, sometimes referred to as the windpipe
- **Veins** – Small tubes or vessels for blood returning to the heart