

Anatomy

The Respiratory System

The act of breathing in, removing oxygen from the air, and breathing out air containing increased amounts of carbon dioxide, is called respiration. Every time a breath is taken in, air is drawn through the mouth or nose and down the windpipe into the lungs. The windpipe branches into two main tubes before it enters the lungs, where it divides into many smaller tubes that branch out through the lung tissue. At the end of each tube is a tiny air sac, which is surrounded by blood vessels. The blood in these vessels takes up oxygen, a gas contained in the air, and gives off a gas called carbon dioxide, which is a waste product of the process that converts food into energy. In breathing out, the air passes back through the same passages.

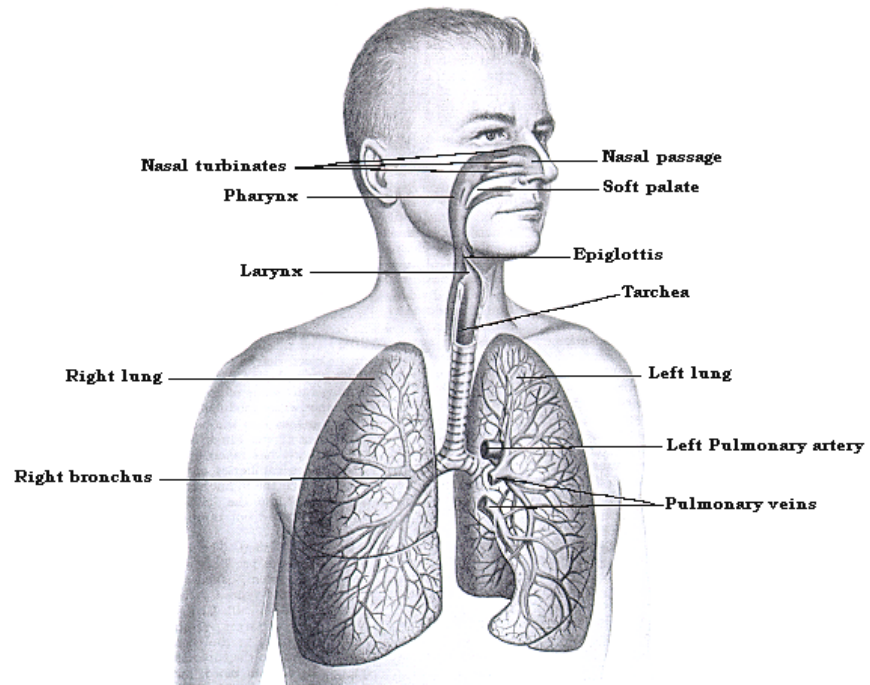
The major components in the respiratory system include the:

- Mouth and nose
- Larynx (voice box)
- Trachea (windpipe)
- Bronchi (tubes that divide from the windpipe)
- Alveoli (air sacs)
- Rib cage
- Diaphragm

Mechanics of Breathing

For air to enter the air passages and the air sacs, the pressure in the lung tissue must be lower than the air pressure outside the body. To enable this to happen, the diaphragm moves down, a little like a plunger in a syringe, and at the same time, the ribs and chest wall move out. The result is an increase in space inside the chest and a lowering of the pressure in the lung. Since this pressure is now lower than air pressure, air flows through the air passages (inspiration). To exhale (expiration), the pressure must rise. This is brought about by the diaphragm moving up and the ribs and chest wall moving in. The action of breathing in and out resembles the action of a set of bellows.

RESPIRATORY SYSTEM



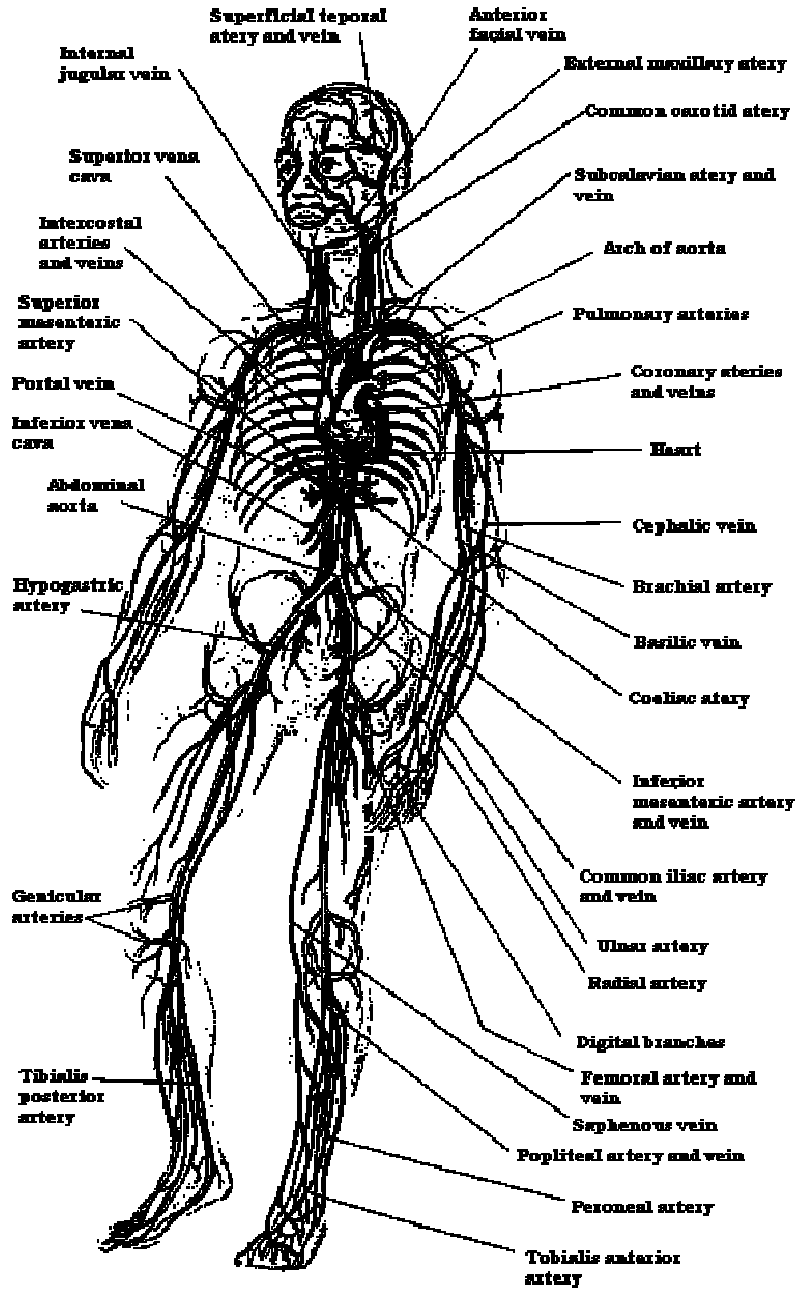
The Circulatory System

The circulatory system acts as the transport system of the body. Its vital role is to carry oxygen, water and food to all parts of the body and at the same time to remove waste products. It also plays an important function in maintaining a constant body temperature. The driving force for this transport system is the heart. The transporting medium is the blood and the arteries. Veins and capillaries provide the pipes through which the blood can circulate.

Blood

Apart from its transport function, the blood contains many components that prevent and fight infection. Its main components are:

- Red cells which carry oxygen and carbon dioxide
- White cells which combat infection. The number of white blood cells increases whenever body is under attack from infection
- Platelets which are involved in the clotting process—this is vital in control of bleeding
- Plasma—the fluid component of blood.



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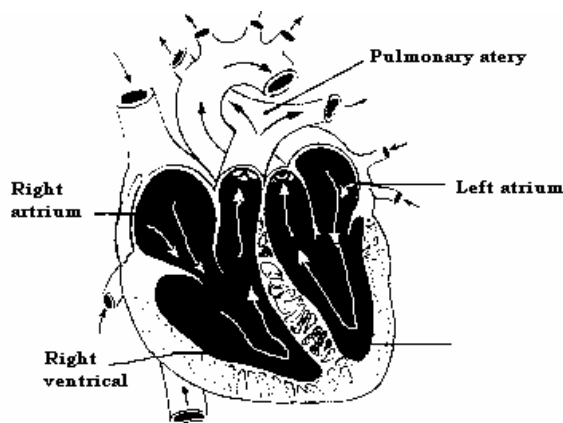
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The Heart

The heart is a muscular pump, which is located in the centre of the chest. It is approximately the size of a clenched fist. It is divided into four separate chambers. Two chambers act as reservoirs and two have a pumping role. The pumping chambers are guarded by non-return valves so that the blood can only pass in one direction. Blood returns to the heart from the body tissues through the veins. The veins join together to form two large vessels, one from the upper and the other from the lower part of the body.

The blood from these vessels drains into the upper chamber (right atrium) of the heart. It then flows into the lower chamber on the right side (right ventricle) and is pumped into the pulmonary artery and to the lungs. This is a vital step in the circulation as the passage of blood through the lungs allows carbon dioxide to be exchanged for oxygen. The blood returns to the heart in veins which drain into the upper chamber on the left (left atrium). From there it passes into the pumping chamber on the left (left ventricle). It is pumped into the major artery of the body, which has many branches distributing blood to all parts of the body.

The heart pumps by contracting and squeezing blood out through the blood vessels. It then relaxes and fills with more blood. The pumping action of the heart is felt as a pulse in various locations. The heart or pulse rate is influenced by the volume of fluid in the circulatory system, by chemical changes in the blood and by nervous reactions. Veins carry blood toward the heart while arteries carry it away from the heart. No exchange of gases, food or waste products occurs through the walls of arteries or veins. The exchange of these substances between the circulatory system and the walls of the body can only occur across the wall of capillaries. Capillaries are tiny vessels whose walls are only one cell thick. They provide the connection between the arteries and veins, thus completing the circulatory system.



The heart (showing the direction of blood circulation)

The Nervous System

The nervous system controls every conscious and unconscious action of the body. It may be compared to a sophisticated computer that is able to program itself. There are three major components in the system: the brain, the spinal cord and the nerves.

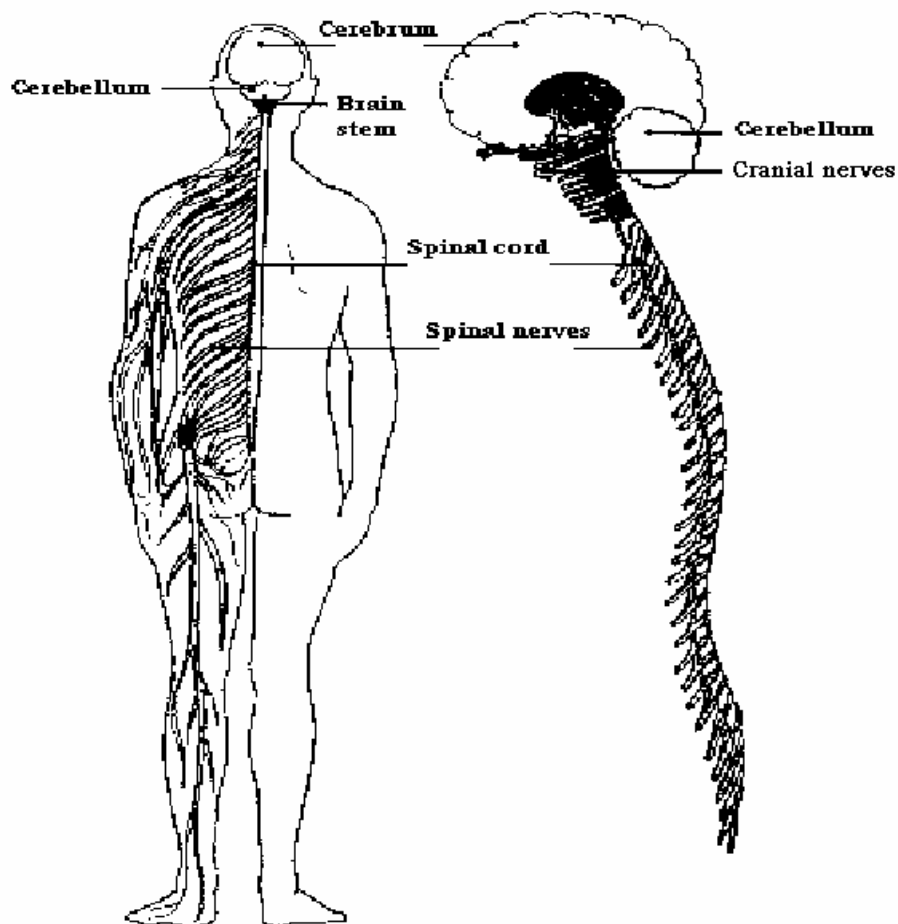
The brain receives messages through incoming or sensory nerves and the special nerves connected with sight, hearing, smell, touch, pain, temperature and balance. It then decides on a course of action and sends commands to various parts of the body through outgoing or motor nerves.

Some body functions continue without conscious effort on our part. The autonomic nervous system controls these through the involuntary muscles of:

- Breathing
- The heart and blood vessels
- The bowel
- The glands
- Other organs

The spinal cord is composed of tissue similar to that in the brain. It leaves the under surface of the brain through an opening in the base of the skull. The signals which make contact with the muscles, skin and other organs travel along the nerve tracts which are contained in the spinal cord. These tracts carry information (sensory) to the brain and messages (motor) to the muscles and other tissues of the body.

Whenever the passage of information is interrupted, e.g. if the spinal cord is damaged or a nerve is cut, there is no access for messages to or from that part of the body to the brain. If this damage is in the neck region, the casualty can be paralysed from the injury site down.



The Skeletal System

The skeletal system forms a strong framework for the body. Bones combine remarkable strength with lightness and have the added benefit of being able to repair themselves. Inside bones is bone marrow, which makes blood cells.

The skeleton

- Gives shape to the body
- Allows movement (muscles pull against bones)
- Protects vital organs (ribs and skull)
- Makes blood cells (bone marrow)

The skeleton can be divided into three sections: the skull, the trunk and the limbs.

The Skull

The skull consists of:

- The cranium
- The bones of the face

The cranium is made up of a number of bones that have fused together to hold and protect the brain. There are several openings in the skull through which blood vessels and nerves enter and emerge. A large opening at the base of the skull permits the spinal cord to connect with the brain.

The bones of the face are the upper and lower jaw and two cheekbones. These support the muscles that are used in chewing, swallowing and speaking.

The Trunk

The spine is a strong, flexible pillar, which supports a number of structures of the body. It also carries the nerves, which branch out to every part of the body. There are 33 bones (vertebrae) in the spinal column. Flexible discs between the vertebrae absorb sudden shocks. The chest is formed by the backbone and 12 pairs of ribs, which curve from the backbone round toward the centre of the chest. At the front of the chest is the breastbone, to which the upper ten ribs are attached on each side. The other two pairs of ribs, which do not join the breastbone, are called floating ribs. The rib cage protects the heart and lungs and helps in the process of breathing.

The abdominal and pelvic cavities are enclosed by the lower spine behind, the diaphragm above and abdominal muscles and the pelvis on the sides and front. They contain the major digestive organs, the spleen, the reproductive organs in the female, and the urinary system.

Principles of Exercises & Stretching

Exercise Sets

All exercises are done **FIRST** with the principle of **NON INJURY** and **SECOND** for improvement/development. Students should have their exercise movements checked by their instructor before proceeding on to any great numbers.

1. Push ups

Main aim - development of Triceps and Pectorals

Main chronic injury concern - lower back

To avoid main chronic injury concern - curve lower back slightly by crunching the stomach.

2. Sit ups -

a. upper abs

b. lower abs

c. diagonals

Main aim - development of abdominal muscle group

Main chronic injury concern - lower back and back of neck

To avoid main chronic injury concern - curve lower back slightly by crunching the stomach (so that the lower back is touching the ground) & tuck chin into chest.

3. Squats (shoulder)

Main aim - development of quadriceps

Main chronic injury concern - lower back

To avoid main chronic injury concern - look up at 45 degrees when squatting

4. Jump (tuck)

Main aim - development of jumping muscle groups: ie, quadriceps, calves and hip flexes. **Main chronic injury concern** - ankles, knees and lower back.

To avoid main chronic injury concern - land on balls of your feet and bend the knees as you land.

5. Floor sprints (shuttle runs).

These have you running from one side of the Dojo to the other touching base lines, running forward, side and backwards. Across and back being one count.

Main aim - development of total body mobility

Main chronic injury concern - fainting.

To avoid main chronic injury concern - awareness and stop if you feel dizzy.

6. Stretching

Stretching must be done in the following order:

a. body joint mobilisation

b. static stretching (floor work first, then standing)

c. developmental stretching (done after body temperature has risen, ie, after exercises)

Physiological Facts

Body proportions are different

- young children have larger heads
- young children have relatively short legs
- just prior to adolescent growth spurt, children's arms and legs are disproportionately long

** be aware that this will alter the child's ability to balance*

** realize this affects running ability*

** group children according to physical development rather than age*

Finally, bone development is not completed until about the age of 17 or 18 and children are less tolerant of heat and cold.

Safe Exercise for Juniors

Keeping in mind that the child's bones are still forming should determine the type and intensity of exercise and practice you: prescribe.

PUSH UPS

Should *never* be performed by juniors on their knuckles - flat hands only. Knees should *always* be on the ground as the upper body is not strong enough to support the back.

SIT UPS

Should *never* be performed with straight legs and the hands behind the head. Children's stomach muscles are not sufficiently developed and the hands will put pressure on the necks from behind and the lower back will be overextended. Suitable sit-ups are: anything with *both* knees bent and hands on chest or stretched in front. Use these with a turn to each side to condition the oblique muscles rather than the "elbow to knee" which can over stress young bodies and require good co-ordination.

GENERAL POINTS

Do not bounce while performing flexibility exercises.

Perform continuous jumping/hopping exercises on a surface that has give in it e.g. grass mats, timber floors.

Shoes are recommended for any prolonged exercise of this nature. Children are better off performing a small number of repetitions and making sure that they are done correctly that sacrificing good technique in trying to achieve large numbers of reps.

Safety Checklist

The following points will assist you in preventing injuries at your club.

** Warm up and stretch*

Make adequate provision with your individual students ages and abilities in mind

** Development of skill and techniques*

Higher the level of skill lowers the level of injury

** Fitness*

Do not let juniors participate if they are sick or injured. Check and be responsive when children show signs of tiring, as this is when accidents occur

** Dojo*

Check for obstacles e.g. chairs and make sure the surface is level, and not too slippery

*** Protective gear**

Ill-fitting equipment can be a hindrance but protective gear is a must for juniors

*** Supervision**

Instructors must be in control at all times.

Do not join in with class unless there is adequate supervision still available. Set attainable rules that all juniors, no matter what the age, understand.

First Aid and Anatomy

First aid remains one of the most important of all life's skills. The simple yet essential skills to preserve life in an emergency, to protect a casualty and hasten the healing of injuries, are skills, which no sportsman can do without.

The following tables contain information on injuries that may be experienced during your martial arts career, it's important to remember when applying first aid you should always follow the DRABC action plan (Danger, Response, Airway, Breathing and Circulation) before any other action is taken.

| TARGET | POSSIBLE CAUSE OF INJURY | INJURIES | SYMPTOMS | FIRST AID |
|---------------------------|--|---|---|---|
| Shoulder | Blow, Pull or Fall | Strains or sprains of the ligaments, dislocation of the shoulder joint | Pain, lack of mobility, swelling or deformity | Immobilise the limb. Apply ice for (sprains & strains). Seek medical help |
| Chest | Blow | Bruising over sternum. In females breast injuries can be more serious as internal bleeding occurs. Damage to the costo chondral cartilage (junction or the ribs to sternum) or fractured ribs | Pain, swelling, especially when breathing or coughing | Apply ice, elastic wrap strapping (for fracture). In injuries involving female breasts seek medical help as soon as possible. Fractured ribs require medical attention |
| Upper Abdominal region | Blow, kick or fall | Epigastric region (solar plexus) abdominal wall muscle spasms. Rupture of the spleen (left side under floating ribs) Rupture of liver (right side under ribs) | Pain, shortness of breath. Slowing of pulse. Pain and weak pulse with pallor swelling of the abdomen. Drowsiness and shock. | Place patient on their back, elevate the legs. If rupture of spleen or liver is suspected seek medical aid as soon as possible. |
| Lower abdominal and groin | Blow, kick or fall | Internal bleeding. Disrupted blood supply. Fractured pelvis. Internal organ damage. | Pain, nausea or vomiting, grunting breathing, blood in urine, blood escaping from anus or genitals, rigidity of abdominal muscles and shock | For abdominal. Loosen clothing, place on back, raise head and shoulders slightly and place a blanket under the knees. For pelvis. As above. Immobilise on firm support instruct casualty not to pass urine. For all cases give nothing to drink and seek medical aid as soon as possible. |
| Knees | Blow, kick, fall, twisting and muscular contraction. | Torn medial collateral ligament, torn anterior ligament, torn femurtibia hamstring and fractured kneecap. | Pain over kneecap, loss of power and instability, tenderness and swelling | Lay casualty down and raise shoulders slightly, do not attempt to straighten knee, splint leg if possible then apply a pressure bandage and seek medical aid. |
| Shoulder | Blow, Fall | Fractured upper arm, dislocated shoulder, fractured collarbone. | Pain, loss of function of arm, swelling, and deformity. | Ask casualty not to move the injured part, immobilise fractures with slings. For dislocation rest joint in the most comfortable position and apply ice pack. In both cases seek medical aid. |
| Elbow | Blow, fall | Dislocation | Pain, swelling, deformity, loss of function. | Do not attempt to reduce dislocation, rest joint in most comfortable position, elevate if possible, and apply cold ice pack. Seek medical aid. |
| Wrist | Twisting, fall | Dislocation, fracture, sprain, strain | Pain, swelling, deformity, loss of function. | Ask casualty not to move the injured part, immobilise fractures with slings. For dislocation rest joint in the most comfortable position and apply ice pack. In both cases seek medical aid. |

| TARGET | POSSIBLE CAUSE OF INJURY | INJURIES | SYMPTOMS | FIRST AID |
|--------------|--------------------------------|---|---|---|
| Ankle | Twisting, over stretching | Dislocation, fracture, sprain, strain | Pain, swelling, deformity, loss of function | Ask casualty not to move the injured part, immobilise fractures with slings. For dislocation rest joint in the most comfortable position and apply ice pack. In both cases seek medical aid. |
| Head, temple | Blow, fall | Concussion, fractured skull or temple cartilage, possible internal bleeding | Loss of memory, headache, blurred vision, altered response and loss of consciousness. | Turn to a stable position, clear and open airway, monitor breathing and circulation, control any bleeding (do not apply direct pressure to the skull if a fracture is suspected) seek medical aid urgently. |
| Eyes | Blow | Blindness | Pain, redness, blurriness, watering of the eye inability to open eye spasm or twitching of eyelid and swelling. | Lay casualty on the back, place a light dressing over both eyes (ensure there is no pressure on the injured eye. Seek medical aid urgently. |
| Nose | Blow, fall | Nose bleed, broken nose | Bleeding, swelling, deformity, pain and bruising | If bleeding sit casualty down with head slightly forward apply slight pressure to soft part of nostrils and place cold towel to back of neck and forehead. If broken control bleeding and seek medical aid. |
| Jaw | Blow, fall | Broken jaw, dislocation | Pain, swelling, deformity, misalignment of jaw and teeth, drooling of saliva. | For fracture support the jaw and keep the airway open. Seek medical aid. For dislocation remove dentures if required, support the jaw and seek medical aid |
| Teeth | Blow, fall | Loss of tooth | Bleeding, tooth missing | Save the tooth, clean tooth with milk or have the casualty suck the tooth (do not handle the root of the tooth) if possible place the tooth back in position, place foil over the tooth and two neighbouring teeth and have the casualty bite down. Seek dental aid |
| Neck | Blow, fall, excessive pressure | Damage to Larynx, damage to carotid artery | Pain, dizziness, Hoarseness of voice, loss of consciousness. | Seek medical aid |
| Spine | Blow, fall | Severed spinal cord, fractured vertebrae, damaged disc | Pain, absent or altered sensation, loss of movement, tenderness. | Do not move the casualty unless essential, maintain a clear and open airway, apply a cervical collar to minimise movement of the neck. Seek medical aid urgently. |

The human body is a complex structure. It is important to have some understanding as to how it works, not only as a means to choosing target areas but also as an aid to injury prevention.

The human body is a living machine that converts food into energy. For this to happen, each cell has to be provided with food, oxygen and water and a waste disposal system. The following information and diagrams provide some explanation of these systems.

Termination Principle

Kill Theory using the 4 Systems

1. Circulatory system: by affecting the blood supply to the brain enough to cause death, by using strangles, strikes, impacting.
2. Respiratory system: by affecting the airway enough to stop oxygen to the brain, by using chokes, strikes.
3. Nervous system: by affecting, eg the spine enough to stop all functions of the body by using strikes.
4. Meridians system: pressure point and affecting the flow of Ki (ie dim mak) death touch.