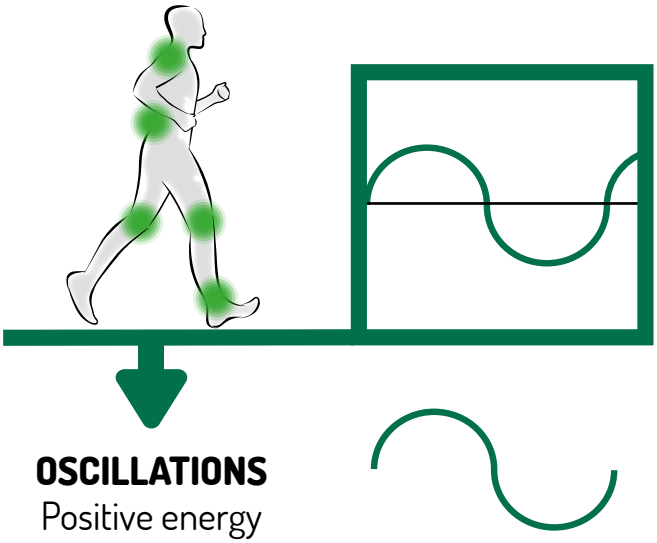
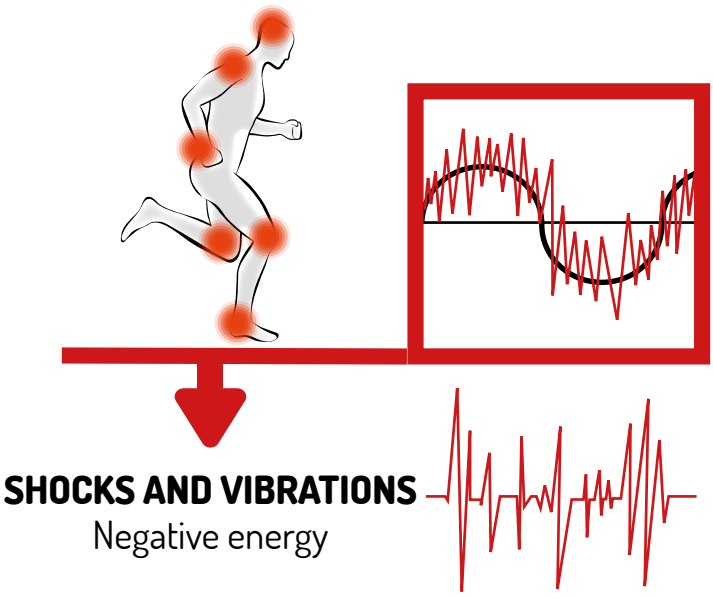
SHOCKS AND VIBRATIONS WHAT ARE THEY?



OSCILLATIONS
Positive energy



SHOCKS AND VIBRATIONS
Negative energy

Source: Betti G., Castellani A., Piga R.
Tecnologie ed Applicazioni Pratiche Calzetti e Mariucci Edizioni

We generate energy waves with every movement, adding to them **micro-shocks** caused by external causes such as the impact of the foot on the ground or the use of a tool.

This energy can be beneficial or harmful depending on the tolerance level of our body segment known as Natural Frequency.

When our body absorbs energy waves within the limits of the tolerated Natural Frequency we are in the presence of Oscillations.

When our body absorbs energy waves beyond the limits of the tolerated Natural Frequency we are in the presence of Shocks and Vibrations.

Energy Waves can be measured and are characterised by several parameters such as:

- **Frequency**, expressed in Hertz (Hz) which represents the number of times in 1 second that the same wave configuration is repeated. Frequency can be classified as follows:
  - **LOW FREQUENCY** (0.1 to 2 Hz) walking or change of direction
  - **MEDIUM FREQUENCY** (from 2 to 20 Hz) walking or climbing down a flight of stairs
  - **HIGH FREQUENCY** (> 20 Hz) brisk walking, jumping or running
- **Amplitude**, expressed in centimetres (cm). A wave amplitude characterises the quality of movement.
- **Speed**, expressed in centimetres per second (cm/s). The speed depends from the wave propagation means, which can be solid or elastic.
- **Acceleration**, expressed in multiples of the acceleration of gravity (g). Acceleration is proportional to the distance between the source of the Energy Wave and the affected body segment.

The effects of Energy Waves also depend on other factors, such as:

- **Exposure Time**, which may change from a few hundredths of a second all the way to minutes or even hours in a day.
- **Ergonomic Factor**, which depends on the postural position of the person.

The Energy Waves have infinite variables and it is impossible to establish the absorption capacity for each individual/situation.

Therefore, for our well-being or in sports performance, it is essential to reduce the Negative Energy Waves caused by Shocks and Vibrations.

THE CONSEQUENCES OF SHOCKS AND VIBRATIONS

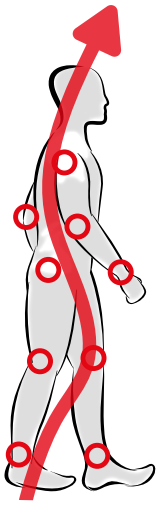
SKELETAL SYSTEM

Cervical area

Lumbar area

Knee

Foot

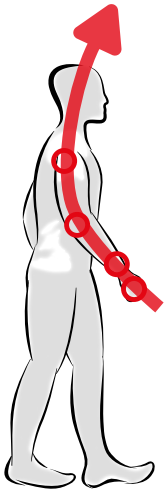


Shoulder

Elbow

Wrist

Hand



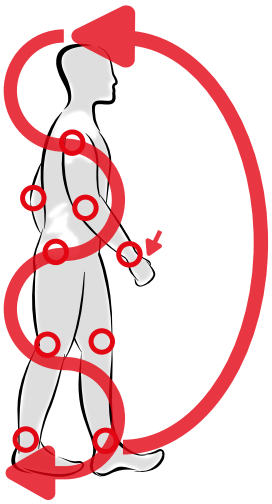
MUSCLE-TENDON SYSTEM

Energy Waves
Input signal

Sensory receptors
Foot, hand, etc. mechanoreceptors

Peripheral and central nervous system structures

Muscle-tendon system



The transmission of Energy Waves occurs mainly through solid bodies such as the bones of the human body held together by the joints.

The mechanical or biological reduction caused by natural ageing or by injuries caused by daily or sports activities, increase the possibility that the Negative Energy of Shocks and Vibrations is not absorbed in the ascending path along the skeletal system:

Foot - Knee - Lumbar area - Cervical area
Hand - Wrist - Elbow – Shoulder

The result is a degenerative process, more or less acute, in the area considered weaker, which manifests itself mainly in the form of:

- **Joint pain**
- **Stress fracture**
- **Heel pain**
- **Epicondylitis**
- **Periostitis**
- **Metatarsalgia**
- **Back pain**
- **Tingling**

Energy Waves, transmitted mainly through the skeleton, generate "work" for muscles and tendons, which are activated on the basis of information received from a complex but efficient signal transmission system that follows the path described below:

Energy Waves - Input signal
Sensorial Receptors - Foot, hand, etc. mechanoreceptors
Nervous System Structures - Peripheral and Central
Muscle-Tendon System

Muscle-tendon activity allows meeting balance, movement, coordination needs and more. The Negative Energy of Shocks and Vibrations can lead to an abnormal response of muscles and tendons, causing fatigue and inflammation that occur mainly in the form of:

- **Muscle sprain**
- **Insole fasciitis**
- **Achilles tendon inflammation**
- **Muscle strain**
- **Patellar tendon inflammation**
- **Lumbar pain**