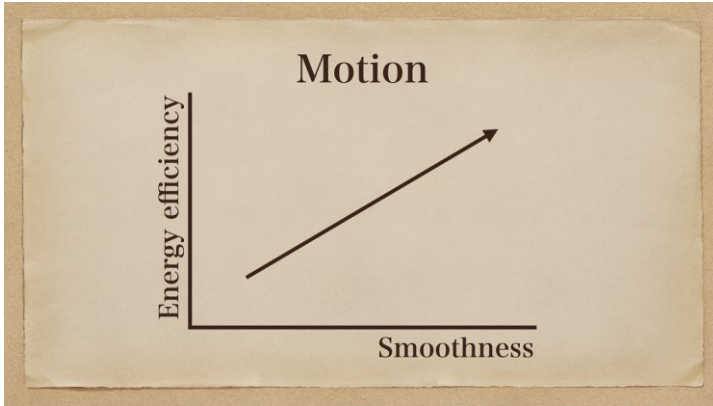


Chapter 1: Viewpoints

What is good movement? I have been working on this question for many years. In the process of this effort, I have reached the viewpoint that it is “smoothness” and “energy efficiency”. These viewpoints are the basis for the self-care methods introduced in this book. Chapter 1 explains these viewpoints.



1-1: Motion Smoothness

Smoothness is a word used in everyday life to describe a state of motion. What is “smooth motion”?

1-1-1: Definition

Imagine riding a bicycle on a road. If the road is flat and there is no excess resistance on the tires, the bicycle will move smoothly. If the road is uneven and the tires experience excess resistance, it will be difficult for the bicycle to maintain its smooth motion. In other words, the bicycle will slow down in response to the excess resistance.

Smooth motion is motion without excess resistance. I think we can say it this way. This definition is very practical; however, it is sometimes insufficient. Imagine riding a bicycle on ice. If the tires slip on the ice, the bicycle will immediately move in an undesirable direction. Motion that results in improper acceleration is also not smooth.

Smooth motion is motion without improper changes in velocity. This is the definition of “smooth motion” used in this book.

When do improper changes in velocity occur? To change the velocity at which an object moves, some kind of force is needed. Therefore, improper changes in velocity occur when either an excess force (resistance) is applied to the object, or the necessary force (resistance) is not properly applied to the object.

For example, when a part of the body becomes less flexible, its related postures or movements experience excess resistance. When a structure in a part of the body breaks down, the necessary resistance for the related postures or movements is not properly applied. Various factors affect the smoothness of motion.

1-1-2: Factors

Human body motions are influenced by various factors. Some of these factors are listed below.

- **Individual factors**

Age, sex, body usage, etc.

- **Structural factors**

Skeletal form, muscle length, tissue flexibility, tissue sliding, etc.

- **Functional factors**

Muscle tension, muscle force, mechanical stress, etc.

- **Mental factors**

Anger, anxiety, etc.

- **Environmental factors**

Shoes, chairs, weather, etc.

This list of factors that influence body motion is not complete; there are many other factors that can be involved.

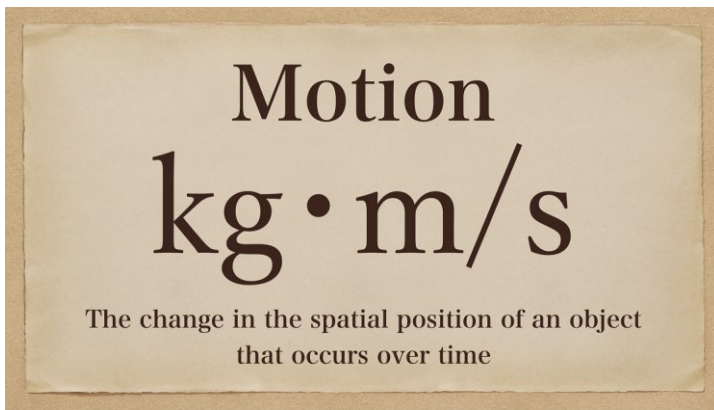
Importantly, some of these factors can be changed, whereas others cannot. For example, it is impossible to change age or sex, and it would be difficult to change

the skeletal form. On the other hand, it is possible to change the tissue flexibility and sliding, and it is also possible to change the body usage.

Various factors affect the motion of the body. Said another way, various factors can limit body motion.

1-1-3: Motion Limitation

What is motion limitation? In my first book, “One Idea for Physical Therapy”, I stated that “motion is the change in the spatial position of an object that occurs over time”⁽¹⁾. I also included the following figure.



If an object's spatial position cannot change properly over time, its motion is considered limited. In this book, a motion limitation represents a condition in which a body part is unable to change to its proper position during a posture or movement.

For example, when raising the arm, the movement involves not only the shoulder joint but also the scapula, clavicle, ribs, and spine. If a part of the spine cannot move to the proper position, disrupting the movement of raising the arm, that part of the spine is considered to have motion limitations.

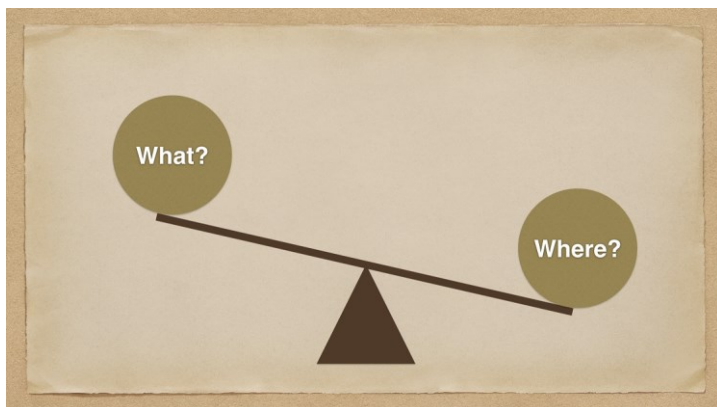
If there is a motion limitation in a body part, various problems can occur. For example, excess resistance occurs in the postures or movements involving that body part, which decreases their smoothness. Removing motion limitations will contribute to improving the smoothness of postures and movements.

As another example, if there is a motion limitation in a body part, it often causes improper stress on other body parts during postures or movements. This stress is called “mechanical stress” and is caused by physical forces such as compression or tension. Mechanical stress is one of the factors that causes physical pain. Therefore, removing motion limitations can reduce improper mechanical stress on the body and reduce the pain caused by that stress.

In the book “Movement Creates the Mind”, Yutaka Haruki stated that “the mind is born from the movement of the body” ⁽²⁾. That is, changes in the postures or movements of the body can influence mental health. Therefore, removing motion limitations and thus increasing diversity in possible postures and movements can have positive effects on mental health.

There are interactions in the human body. Various factors affect the body’s motion, and at the same time, the body’s motion affects various factors. Not all motion limitations can be removed. Not all problems can be solved. However, removing motion limitations and improving the smoothness of motion will contribute to addressing various physical problems and improving quality of life.

Motion limitations can occur in multiple parts of the body. The self-care methods presented in this book emphasize recognizing where motion limitations exist in the body rather than what factors are limiting the motion. In other words, the “where” is more important than the “what”. A method for finding motion limitations is introduced in more detail in Chapter 3.



1-2: Motion Energy Efficiency

Energy is a word used in everyday life. In physics, the word “energy” refers to “the ability of an object to do work”. What is “energy-efficient motion”?

1-2-1: Definition

Various forces are involved when our body moves. “Muscle force” is one example of them. However, it is not the only one. For example, there is “gravity” on Earth. Earth’s gravity constantly pulls our bodies toward the ground. When our body is in contact with the ground, a force from the ground called the “ground reaction force” is applied to our bodies. This force enables us to perform various movements, such as walking and running. Imagine being in space. It is impossible to walk freely in the weightlessness of space because there is no ground reaction force.

What is “energy-efficient motion”? When our body exerts force, some energy is needed. For example, muscle force requires energy that is released from adenosine triphosphate (ATP) in the cells. However, the amount of ATP in the cells is finite.

When the human body is regarded as one system, forces acting from outside the body, such as the Earth’s gravity and the ground reaction force, are called “external forces”. By making good use of external forces, it is possible to reduce excessive ATP consumption by muscles. **Energy-efficient motion is motion that makes good use of external forces.** This is the definition of “energy-efficient motion” used in this book.

External and Internal Force

- External Force

Gravity, Ground reaction force, etc.

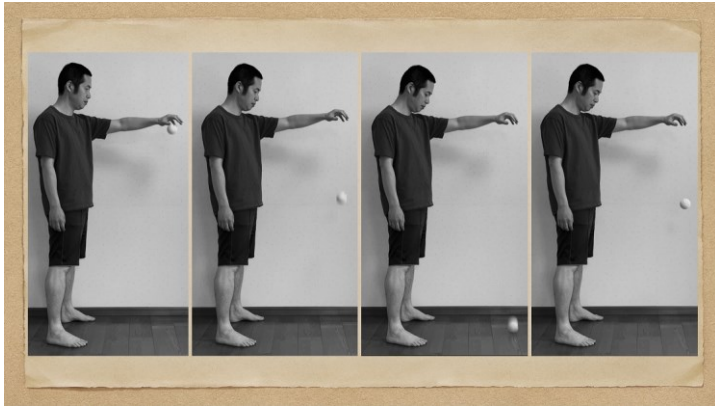
- Internal Force

Muscle force, Elastic force, etc.

(When the human body is regarded as a single system)

1-2-2: Body Elasticity

What does it mean to make good use of external forces? Please see the following figure.



When a ball is lifted to eye level in the standing position, the ball has potential energy. When you release the ball from your hand, it falls toward the floor. When the falling ball contacts the floor, the shape of the ball changes instantaneously because of the ground reaction force. This action allows elastic energy to be stored inside the ball. Using this elastic energy, the ball bounces upward and regains potential energy.

The same phenomenon as shown in the figure above occurs inside our body. When external forces act on our body in motion, the shape of our body changes accordingly. In response, our body generates a force as it tries to return to its original shape. This force is called the “elastic force”.

Making good use of external forces leads to good use of the body’s elasticity. Therefore, we can say that **energy-efficient motion is motion that makes good use of the body’s elasticity.**

1-2-3: Advantages

What are the advantages of using external forces well? Using external forces can allow for the proper use of the elasticity of the body during postures and movements. This elasticity prevents muscles from consuming excessive energy and allows for energy-efficient postures and movements. Therefore, **energy efficiency**

is one of the advantages of using external forces well.

To avoid misunderstanding, I do not deny the value of muscle. Muscle forces are essential for the motion of the human body. However, exerting great power through the action of muscle force alone is often difficult. By making good use of external forces, it is possible to generate great elastic forces in the body and exert greater power. **The ability to exert greater power** is another advantage of using external forces.

The following paragraphs are my subjective opinion; there are no quantified data of any kind. In my daily experience, I feel that postures and movements that make good use of external forces are associated with less improper mechanical stress in the body than those that rely too strongly on muscle forces. Another advantage of using external forces well is that **the risk of physical injury is small**.

Why do postures and movements that rely too strongly on muscle forces cause improper mechanical stresses? When we perform a posture or movement that relies too much on muscle forces, an excess force that is not directly related to the posture or movement is inevitably generated. As a result, a discrepancy occurs between the action of external forces and that of muscle forces. In other words, the direction of the force action is not aligned. I believe that the discrepancy between the action of external forces and that of muscle forces is what causes improper mechanical stress.

Excessive reliance on muscle forces results in high levels of improper mechanical stress. This tendency is more pronounced in people with low water content in the body, such as older people. Fluid can absorb shock. As the body's internal water content decreases, converting kinetic energy from excessive muscle activity into thermal energy becomes more difficult. As a result, excessive kinetic energy has undesirable effects.

Good use of external forces has the following advantages:

- **Energy efficiency**
- **Sufficient power**
- **Low risk of physical injury**

Summary of this chapter

This chapter introduces the viewpoints of “motion smoothness” and “motion energy efficiency”. These viewpoints are foundational to the self-care methods presented in this book.

Smooth motion is motion without improper changes in velocity. This is my basic idea. Smooth motion can also be described as motion without excess resistance. If there is a motion limitation in a body part, it creates excess resistance in its related postures or movements. This excess resistance makes it difficult to perform postures and movements smoothly. In addition, motion limitations can cause a variety of problems. By removing motion limitations, it is possible to improve the smoothness of motion, which will contribute to addressing a variety of physical problems and improving quality of life.

Energy-efficient motion is motion that makes good use of external forces. This is my basic idea. Energy-efficient motion can also be described as motion that makes good use of the body’s elasticity. By making good use of external forces, it is possible to make the body’s elasticity work properly when performing postures and movements. Elasticity prevents excessive energy consumption in the muscles and allows for energy-efficient postures and movements. In addition, postures and movements that make good use of external forces reduce improper mechanical stresses in the body, which in turn reduces the risk of physical injury.