# Innovative and effective perspective of health improvement

*Paper on the theoretical background of I.M.Health project*

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## I.M.Health

### ERASMUS+ Sport

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## 0. INTRODUCTION

In the course of our research and activities, we have come to the assumption that physical and mental development affect each other, are related, and that both can be developed more effectively together than separately[1]. Below, we describe both the experiences and knowledge, and the path and method with which we arrived at this assumption. This description serves as a theoretical background during the 'Innovative methods for preserving and enhancing health in the 21st century' project (hereinafter: I.M.Health). It can also help professionals to develop, evaluate and understand the background of additional physical and mental development tools and methods.

The paper is structured as follows.

1. **Observations:** First, we briefly summarize the observations and research results that served as the basis for the assumption. These are partly the observations of the organizations participating in the I.M.Health project, primarily the Fontanus Center, and partly come from publicly available scientific publications.

2. **A unified theoretical model:** We place the knowledge derived from experience [knowledge from here on] into a unified model. This is necessary to be able to create a connection between the observations and results of different scientific fields, for which the unified model provides adequate frameworks. We can assume that at this point it will be necessary to clarify and explain further facts and knowledge in order to shed light on the supposed connections.

3. **Correlations:** If we manage to place the knowledge in the unified model and find connections between them (so we conclude that there is a connection between the physical and mental development of a person), we can assume that methods can be created that develop both areas at the same time.

Based on this line of thought, the Fontanus Center has developed several methods which, based on assumptions and practical experience, are suitable for the joint and effective development of physical and mental abilities and competencies. One of these methods is the *Balance*[2] therapeutic exercise and training method, another is *Water Skyball*, an aquatic sport with special rules. Within the I.M.Health project, we are conducting studies on the developmental effects of these two involving one hundred people from four countries.

[1] *There are studies and research on the connection between physical and cognitive development that support the claim. However, in this paper, we use the concepts of the physical and mental level of a person in a specific framework - based on the consciousness model of Balázs Török-Szabó's work: The Theoretics. These concepts will be further explained in the paper.*

# 1. OBSERVATIONS

## 1.1. Changes in the range of motion

*Based on our observations, the quantity and quality of movements is related to the range of motion of the joints*.

If a person engages in only minimal physical activities for an extended period of time (e.g. leads a sedentary life and does not play any sports), or does not use his joints in a certain direction (e.g. almost never raises his arm above the shoulders), the range of motion of his joints becomes narrower. Based on surveys and observations, the degree of narrowing also depends on the individual's abilities, but it can be shown in all cases that, compared to the previous range of motion, the joints allow less room for movement as a result of a sedentary lifestyle. For example, after long periods of sedentary work and little sports, the range of motion of the shoulders, hips, and cervical spine is limited, musculoskeletal problems and pains appear, which can be traced back to a sedentary lifestyle. Incorrect posture can increase complaints and symptoms, but even if someone spends time in an ergonomically correct space and in a healthy posture, their movement options will still be limited in the absence of movement.

After insufficient rehabilitation following injuries, it is common for the individual to try and protect the injured part and not use it the same way as before the injury. As a result, he uses other muscles to compensate for certain movements to which the injured body part previously also contributed. This results in balance shifts within the body. On the one hand, the protected part of the body - in the absence of movement - weakens. If the problem also affects a joint then its range of motion is also reduced. On the other hand, the muscles involved in compensation get stronger, but they also get overloaded. All of this often causes asymmetry in the body, which can have further harmful consequences.

Since the locomotor system is a system of closely related structures (muscles, tendons, ligaments, bones), a change in a single area affects the entire system. The shortening of a muscle is associated with pain, the shortened muscles contract the bone ends from which they originate and to which they attach, the joint surfaces tighten against each other, resulting in greater friction, which can result in joint wear and joint movement restriction. Similarly: the weakened muscles do not hold the bone ends together to an adequate extent, so slippage can occur between the joint surfaces, which can also lead to wear-and-tear joint complaints and pain. As a result of the change in the muscles and joints, the individual's movements also change, which results in requiring a different kind of load.

## 1.2. The role of mental training in rehabilitation

*Based on our observations, mental training also makes physical rehabilitation more effective.*

During locomotor rehabilitation - if it is not exclusively passive physical therapy (e.g. massage, mud wraps, soft-laser, etc.) - part of the therapy is to strengthen the injured and possibly surgically repaired part of the body by moving it. They try to restore the balance that was upset by the injury through movement and gymnastics. These movements, physical exercises and other therapies are often painful and last a long time. Based on our observations, injured people who have no knowledge of why the exercises are necessary, or what is happening in their body, or how the movements are related to rehabilitation, are only able to restore their body's balance less effectively than those who are aware of all this. If, during conversations, they understand both their condition and the changes taking place in their body and the importance of regularity - that is, how rehabilitation works - they perform the exercises with greater attention, they are more persistent, they perform the exercises more accurately, and all in all, in their case, they are much more efficient and rehabilitation is faster.

It often happens that someone who has suffered an injury, in other words, a sudden large-scale change happened in his body, and has not processed it - he has not thought about it, he has not talked about it - excludes the area related to the accident from his life. It is common that after a motorcycle accident, the person never rides a motorcycle again; if an accident occurs while playing sports, they stop playing sports, and so on. This is usually accompanied by excluding certain movements and forms of movement from their life.

This is an example of how a change in movement affects the way an individual experiences reality: if he excludes certain possibilities from his life, he cannot experience those possibilities. And the same thing works backwards: if someone does not want to experience them, they won't do the associated movements and forms of movement either (e.g. if one stops playing a given sport after a sports accident, they won't do the associated sports movements anymore).

Those who work with the accident mentally during rehabilitation - process the events and understand what happened - are usually able to return to their previous lifestyle after rehabilitation, learning from what they have experienced. In this way, they do not narrow their own opportunities, but continue to maintain them, and even broaden them by learning from previous mistakes, accidents, and injuries.

## 1.3. How changes in the body affect the individual's experience

*Based on our observations, the change in the quantity and quality of movement affects the individual's experiences*.

The fact that the body changes also causes the individual to experience his environment in a different way than before: he pays attention to something else, pays attention differently. Pain can take attention away from certain things in order to focus on the problematic part of the body and its healing.

A tendency that can be observed is that the amount of physical activity has an impact on how many opportunities one has and how much an individual can experience from the world. If movement is limited for some reason, the possibilities of experience also become limited, and if the possibilities of movements are expanded, then the attention can extend to new things, which results in experiencing new things. For example, if joint range of motion is narrowed, joints move less, which results in trying fewer types of exercise and sports. If certain joint ranges of motion are completely narrowed, it also causes pain and excludes more and more types of movement. A restriction of movement in the knee joint, for example, increasingly narrows even the space that can be traversed even by walking or cycling: a person is literally trapped in an ever smaller physical space.

## 1.4. The effect of physical development on the body and thinking

*Based on our observations, regular exercise affects thinking*.

Based on the observations, those who regularly took part in different types of training not only changed their locomotory organs, muscles, joints and skeletal system, but also experienced changes in other areas. Training also affects the circulatory, hormonal and nervous systems.

Certain types of training specifically stress the circulation. These are usually associated with an increased pulse and breathing rate, and a stronger load on the circulatory system. Their long-term effect is that the individual's circulation becomes more efficient and capable of bearing more load, which, among many other effects, ensures a better sense of well-being and balance, even with increased load. Accordingly, attention can be more easily maintained even in stressful situations, since the body can adapt to the load and function efficiently even when exposed to greater stress.

The same can be observed in the case of regulating the body's hormonal balance. If, during training, the exerciser goes beyond the body's known and usual load limits, i.e. puts a stronger load on the body than what it is used to, it also involves hormonal changes. At first, in most cases, the body initiates a high production of adrenaline and

cortisol, as it evaluates the higher load as being an emergency. However, if this happens several times, the body learns to dose hormones more precisely. The effect of this also appears in stressful situations during everyday life: hormonal regulation can be better balanced for those whose bodies have learned to regulate them during training. Thus, the effect of hormones has less influence on clear thinking for them, they are more balanced, and their attention can cover more factors during their decisions.

Physical activity can also play a big role in managing stress. The stressful situations experienced during everyday life cause hormonal changes in the body that would basically encourage the individual to move[2]. The hormones themselves would be optimally and quickly eliminated from the blood during physical movement. If this does not happen, the hormones accumulated in the blood continuously affect the entire body, all of which leads to additional symptoms and health damage in the long term. However, those who "relieve stress" with physical exercise, that is, exercise and exercise, promote the use and excretion of hormones, can be more balanced, meaning that exercise can also affect their thinking from this point of view.

Certain types of exercise can also affect certain abilities related to thinking. According to observations, regular participation in team sports or team games, for example, has a beneficial effect on team thinking, and physical games that include tactical and strategic elements affect foresight, planning, and strategic thinking. Spatial vision and attention can develop as a result of games that require spatial vision, an overview of a larger area, and following changes in the area. According to the reports, all of this has an effect that can also be experienced in the individual's everyday life. For example, as a result of physical games, where the movement of several players must be constantly taken into account in order to win the game, according to most reports, the development can also be experienced in everyday walking or driving.

Other research also came to the conclusion that physical development has a positive effect on cognitive processes (Ware 2021; Stern 2012; Valenzuela 2006, Mandolesi 2018). In a four-month research[3] sponsored by a Japanese sports brand, they examined whether regular exercise affects mental performance. 77 chess players, mahjong players and e-athletes took part in the research, people who did very little or no exercise. During the study, they incorporated 150 minutes of exercise a week into their lives. During the four months of the study, the participants' cognitive functions improved by 10%, short-term memory by 12%. Their ability to concentrate improved by a third.

Based on the experiences of the Fontanus Center, it can be said that those who regularly exercise, play sports, and take part in training sessions, manage biochemical and related mood changes, stress more effectively, and their thinking is more focused and structured.

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*[2] This is called the "fight or flight" response, which encourages either to attack (fight) or to defend (flight).*

*[3] https://www.asics.com/us/en-us/mk/sound-mind-sound-body-impact-mind-games*

## 1.5. The effect of mental development on movement

*According to observations, the effect of regular "mental training" can also be observed in movement.*

Fontanus has conducted several researches on the effects of mental development. One of these studies, spanning several months, examined the effects of the abstract logic-strategy development game Castle Of Mind (COM). The game is basically designed to promote the development of thinking skills: combinatory, predictive, logical skills, strategic and critical thinking and others. The study participants regularly played the COM game. During the interviews conducted with them, the players also reported that the skills they developed during the game are also reflected in their movements and during exercise sessions. The game itself encourages you to expand your attention as much as possible, both in space and time, in order to win. The one who can see the largest area of the board at the same time and who can think through as many possible situations as possible has an advantage. All of this was also related to the development of attention in movement. Based on what the experienced players said, their movements also became more organized, collected and structured. Their attention extended to more and more things, including their own movements. And this is a fundamental condition for them to be able to improve their own movement by observing it, and thus develop. Several people reported an improvement in spatial vision and that they find their way around more easily, are able to plan in the longer term, and in general: move more thoughtfully. This is also true for the planning of training sessions, but also for the execution of movements during individual training sessions. (Mandolesi 2018; Weinberg 2015; Fernandes 2017)

Overall, based on the experiences of Fontanus, it can be said that those who took part in some form of thinking development training (in mental games or communication development) also improved their movement. Their movements became more thoughtful and organized, they were able to change and develop.

# 2. Placing the observations in a general model

It can be assumed that there are correlations between the above observations and research results. If there are, and they can be discovered, it can also be assumed that physical and mental development can be made more effective by building on these connections. The basic condition of this investigation is that the knowledge and experience can be described in a unified framework, using a unified conceptual system. This allows the connection between different observations and knowledge to emerge.

The knowledge affects different scientific fields, including natural sciences (body and its development) and social sciences (mental development) (Weinberg 2015; Barbas 2000).

Cooperation between them is mostly difficult. When defining the common framework, we therefore chose an approach that is broader than a single specialized area. Philosophy, as a science that also has an insight into the sciences, is suitable for providing the necessary point of view for the investigation.

The model of consciousness presented in Balázs Török-Szabó's work *The Theoretics* describes a complete system, the functioning of consciousness, the relationship between the individual and reality from a comprehensive point of view (Török-Szabó 2017). Since it deals with both the physical and mental aspects of the individual, and moreover in relation to each other, it is suitable for the above knowledge and research results to be placed in it. In addition, the model also covers development as an individual's potential and intellectual capacity[4]. If the knowledge can be placed in the model in relation to each other andn connection with development, then the connections between them can presumably be understood. And these connections can also provide an opportunity to create practical development methods.

*The Theoretics'* model of consciousness is theoretical, i.e. theory about practice. This means that it is based on practical observations, uses the knowledge of several scientific fields, and builds the model based on them. The structure meets the criteria of scholarship, that is, it is consistent and logical. The theoretical theory is verified by its applicability in practice.

In order to examine the relationships between the knowledge and experiences placed in the model, some knowledge will be explained in more detail below.

## 2.1. What is the body?

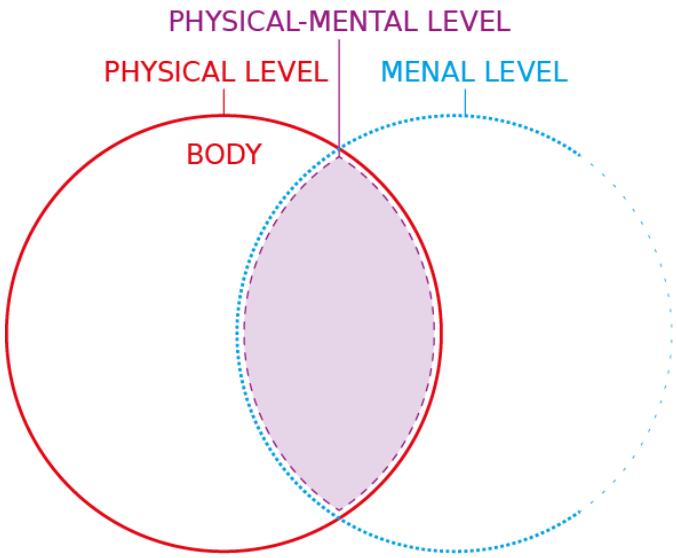
Most of the questions to which the answer seems obvious are not so easy to answer. Everyone knows what we mean by body, human body, until we try to put it into words, explain it, define it.

Different fields of science deal with humans and the human body. The differences between the individual fields result from the fact that they all look at their subject from a different approach. Medicine and psychology generally treat the body as an axiom that does not need to be defined separately. In physics, a body is a given amount of matter that is connected in space and can move together - this can also be understood for the human body. In biology, it is generally understood as the different and characteristic appearance of biological individuals (animals, humans) depending on the species.

[4] *A more detailed explanation of the background of the development can be found in Balázs Török-Szabó's work: The development practice.*

Based on these definitions, the body is therefore a continuous substance that is capable of movement, characteristic of the species, and has an appearance that can be perceived and recognized by the senses.

The approach of philosophy is more comprehensive, so it typically examines its subject not only from one aspect, but tries to grasp it as a whole. Based on the model described in the works of Balázs Török-Szabó *The Theory* and *The Theoretics*, the individual can be understood as a unit of three levels that build on each other and cannot be separated from each other. The physical level of man is the body, which is everything that can be perceived of man through the senses. The mental level is where thoughts are formed, where images and notions are moved. The starting point of these things is the brain as a physical organ, but the thoughts, images, memories, imaginations themselves cannot be grasped on a physical level, they cannot be perceived by the senses, yet they can be experienced by the individual. The overlapping of the two, i.e. the physical and the mental level - which represents the brain as an organ and the processes connected to it - is called the physical-mental level, otherwise known as the mind, in the model.




**1. Physical and mental levels**

Beyond all this, there is the realm of feelings, the emotional level. In this model, feelings are not emotions in the psychological sense, which can be interpreted as a combination of thoughts and biochemical effects, but experiences created when the individual meets reality. These experiences have no specific object. From another approach, feelings are the experiences when the individual experiences (perception) at the physical level and also perceives (understands) it on a mental level in accordance with reality, so that the different levels of his experience (perception and understanding) are in harmony with each other and with reality.

Based on this, the body is the individual's physical level, *which is closely related to his mental and emotional levels*.

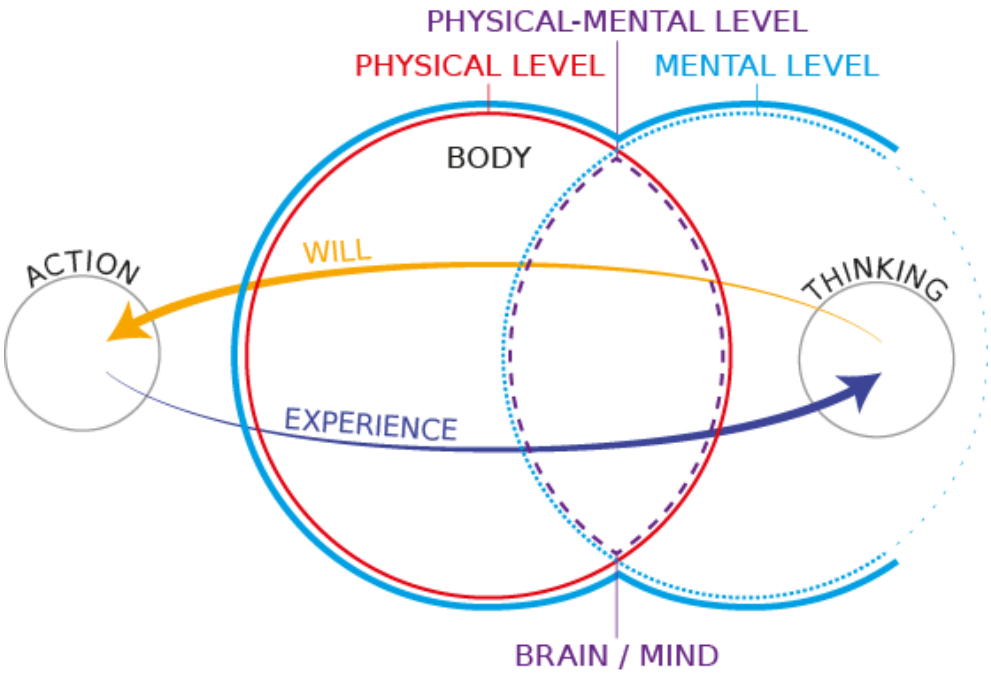
## 2.2. The cycle of will and experience

Based on the model, the relationship between the individual and reality can be realized as follows. (Below is a simplified version of the process.)

The individual *experiences* from reality. This process takes place through the senses - that is, the body, on the physical level. Every incoming stimulus is processed by the physical-mental level, the brain/mind. The images or notions created as a result of the processing reach the mental level, thinking. We can work with these images in thinking.

In the other direction, the flow of information starts from thinking. Through will the individual is able to realize the information compiled from previously experienced images - the process of this realization can be called an *action*. During the process, the will starts from the mental level, reaches the physical level (the body) through the physical-mental level (that is, the mind), and it is the body that realizes it in reality, as an action.

The process is circular. This means that we can experience information from actions, and based on what we have experienced, we can initiate new actions in accordance with our will.




**2. The cycle of will and experience**

Both the experience and the process of will affect the body. Several things follow from this. On the one hand, all changes in the body affect the process of experience - and through this also affect thinking. On the other hand, every change in the body affects actions as well.

If, for example, the body changes as a result of a sedentary lifestyle and the range of motion of the joints becomes narrower, it also leads to different experiences, to a change in the way of experiencing. The locomotor problems that occur as a result of this, and the pain that often accompanies them, are in themselves an experience that affects our attention. This is understandable, since the primary purpose of pain is to direct our attention to the injured or sick part, in order to heal and care for the injured or sick part. Thus, if we experience pain in any part of the body, it also affects our everyday life, since our attention is "busy", so it usually does not cover as many possibilities as without pain. And if the range of motion of the joints is narrowed, we don't use our body as before, and as a consequence of this changed use, we experience differently, we can pick up other stimuli.

## 2.3. Endowments and abilities

In the circular process of will-act-experience-thinking, actions always concern the body and are realized through it. Moreover, there are actions that specifically aim to change the body - since the body is also part of reality. These include exercise.

The human body is characterized by its *endowments* and *abilities*. However, the current state of the body after birth is always a consequence: the result of external influences on us and our own actions.

The *endowments* of the human body are contained in genetics. These are parameters specific to the species on the one hand, and to the given individual on the other (Tortora 2018; Betts 2017).

The characteristic parameters of the species are, for example, that we have two hands and two feet, 5-5 fingers on our limbs, that we have 206-208 bones which are located in the same way in all of us, and the muscles and joints that are also structured in the same way in the body of every person. All of our organ systems have a general, species-specific structure and function. A characteristic of our nervous system is that the control of the body is centralized: most of the stimuli from the body and the outside world run into the central nervous system, where the responses to the stimuli are generated. As a result, the control of the body's processes and the movement of the body begin.

In addition to these, our unique genetics determine a number of unique properties that allow for diverse body structures within the general racial properties. We inherit these parameters from our ancestors through our parents. Because of this, someone can be taller or shorter, the specific gravity of the body, the color of the eyes, the composition of our tissues, the shape of our bones, and so on, can be different. We cannot influence our endowments, they represent a set, a foundation with which we came into the world, on which we can build.

However, it is important to remember that the characteristics carried by the genetic code are not precisely defined parameters, but most of them define certain ranges within which the body can change. For example, we can be taller than average, but at what age exactly how tall we will grow is not decided in advance: it also depends on what effects our body experiences during our life (primarily during our childhood). If you swim regularly, where gravity puts less stress on your bones due to the buoyancy of the water, you will probably grow taller than if you lift weights regularly. The latter gives the body the stimulus that it is more worthwhile to be shorter and more solid, more muscular, because it is easier to lift the weight and you don't have to lift it as high.

*Abilities* can be most simply thought of as opportunities. Some of these are also characteristic to the species. Our two legs - and their bones, muscles, joints, blood supply, and innervation - give us, for example, the opportunity to walk, run or even jump. We are all capable of these, the body is suitable for them, but we do not necessarily have to use them all. However, our structure makes us incapable of staying underwater or flying (without proper equipment) for extended periods of time, so we do not have these abilities.

The complexity of our nervous system, the existence of the central nervous system and the brain mean additional possibilities for humans. We are capable of thinking, and in relation to thinking, we are also given many possibilities - such as logical thinking, planning, strategizing, the ability to be creative and others.

If we use an ability, we can also develop it. During childhood, when we learn to walk, we develop one of the abilities inherent in our legs, walking, by using several other organ systems together (e.g. balance, eye-foot coordination of the brain, etc.). If an ability is not used, it begins to decline. If certain muscles are not used, they become weak, less capable, and atrophy. If we neglect a joint (e.g. due to sedentary work, we only use our shoulders in a narrow range), then its range of motion becomes narrower. This means that if we don't raise our arms for a long time, we won't be able to raise them later even if we wanted to: the tendons and muscles shorten. The reason for this is that it is not worth it for the body to maintain those opportunities that we do not take. In such cases, only after a long process, through a lot of stretching and exercise can the joint regain its greater range of motion.

It's all because the body adapts. Within the given abilities, it is shaped through the ways we use it. If we use it for movement, it builds itself for movement. If we usually use it for

sedentary work, it adapts to it. If we try to take in the right amount of liquid for our body's needs, it can use it optimally. If we don't drink enough, it tries to produce the right amount of water in other ways - for example, by breaking down sugar. (In practice, if you are thirsty, but do not respond to the thirst stimulus for a long time, then your brain will encourage you to eat something sweet instead.) If this fails, our organs try to regulate themselves in such a way that they use less water, for example we experience weakness and fatigue, so that the body needs to use less water when resting.

All this is equally characteristic of the abilities of thinking. If we use them, they can be continuously improved, but if we neglect their use, they become more and more difficult.

As you can see, the state of our body at a given moment in time depends on our abilities as starting conditions, the stimuli that affected the body and how much and how we use its abilities. In other words, the current state of the body is the **consequence** of external stimuli and our own actions.

## 2.4. The brain as a motor organ

The largest percentage of our physical level is the *musculoskeletal system*. Strictly speaking, this includes the skeleton, joints and all muscles. The musculoskeletal system is the part of our body that allows us to move the whole and its parts and that gives it its shape. The skeletal system provides the base and height, the joints provide the basic range of motion, and the muscles provide the shape we create for ourselves.

Based on the fact that the human body is mostly a locomotory organ, it can also be assumed that movement is natural for us, and that if we do not move it, it is unnatural. This is understandable, since during its development, the human race for hundreds of thousands of years obtained food by regular daily movement (e.g. hunting, gathering) and survived by movement (e.g. fleeing from attacks by predators). It became the way it is because it was the most effective way to satisfy instincts, primarily for survival and reproduction. During the last few thousand years - especially the centuries after the industrial revolution-, technology has developed at a rapid pace and has completely transformed the way of life of modern man. However, our body has not adapted to this change. The structure of our body today, even in the 21st century, makes us suitable for living conditions in which the ancient man lived. Not only is it suitable for movement, but it also requires it. For the body it is natural and healthy when it is regularly moved, and this is also what creates a dynamic balance in its processes. Therefore, if we do not move it regularly, it is accompanied by an upset of the balance, i.e. a damage to our health.

Of course, the organ systems cannot be sharply separated from each other. Nutrients processed by the *digestive system* are necessary to move the locomotor organs. These

are transported to the right organs by the *circulation* - and it also transports the substances produced during the use of nutrients. The stimuli enter through the *senses*, and based on these the *nervous system* decides what kind of movement should take place. The central nervous system, the brain controls all processes of the body. Voluntary movements also start from here.

There are movements for which the instruction does not come from the brain. These are the unconditioned reflexes. In these cases, the response to stimuli from the outside world is already born (in the spinal cord) before they reach the brain. Unconditional reflexes also originate from certain parts of the brain. An example of this is the breath-holding reflex, which starts at the brainstem level and is activated when water touches the face. It's a cerebral but unconditioned reflex. These reflex responses are necessary because the body can react much faster to possible dangers. (For example, if we touch something hot, we usually pull our hand away before we become aware of the movement, or if an object approaches our eyes, we involuntarily close our eyes immediately). It is basically valid for reflexes that the incoming stimulus immediately triggers the response. Some of them can be inhibited from the cortical level - by no means all - but they did not develop this way by chance, so their inhibition always has a disadvantage.

It is worth noting that some of the processes and movements controlled by the brain are also reactions. The brain analyzes the incoming stimuli, compares them with knowledge from the body's previous experiences. After processing, the brain issues the instruction, as a result of which the stimulus reaches the appropriate muscles via the nervous system and activates them[5]. We are not necessarily aware of these processes when they happen. If we see an acquaintance in the distance, with whom we associate positive memories, we automatically raise our hand and wave to him. We do it without thinking about what we are doing, with which hand and exactly how to perform the waving movement.

In order to perform the movements, it is not necessary to be aware of all our movements. We are able to run without being aware of each muscle contraction and release during the process. (However, it can be said in general that the more we are aware of the changes in our body, the more effectively we can use and develop them.) Behind these automatically running movements and sequences of movements there are mostly long conditioning processes, many repetitions and practice.

There are moves that require attention from start to finish – typically new moves that we've never done before. This can be when you try a new sport, learn to dance, or when you learn to ride a bike or drive a car. In this case, we usually have an image in our head of how the movement should be carried out. But if it is a sufficiently complex movement, in many cases it also requires the building of brain-nerve-muscle connections, coordination, coordination of several muscles and muscle groups, continuous

[5] *Development practice calls this control **physical thinking**. In this case, the brain works and operates the body based on its previous experiences and aiming to satisfy instincts. Based on the model of consciousness, thinking that differs from this is **mental thinking**, which does not result in a reaction initiated on the basis of instincts, but rather an action initiated on mental level.*

correction based on feedback from the senses, and so on. This is all a lot of energy investment, which is primarily the work of the brain as a central control organ.

We start many of our movements voluntarily, but they are automatic. For example, driving a car and riding a bicycle, when we have already mastered the movements associated with them. Going somewhere by car or getting on a bicycle is something we initiate ourselves, but then we don't need to pay attention to all our movements in order to carry them out, since we perform them routinely. This is useful for the body because it requires less energy consumption. Keeping the body alive is the most important aspect for the brain - based on instinct, from the point of view of survival. In order to do this, it strives for a balance between the use and replenishment of energy. It is safe for it to absorb and use as much energy as possible with minimal energy consumption. (It should be noted that this does not exclude the fact that we can also observe our body during such routine movements.)

In the case of unconditional reflex movements, between experiencing the stimulus through the senses and executing the movement, the stimuli do not reach the cerebral cortex. So no decision or attention is necessary to these movements. The stimulus from the sensory nerve is transferred to a motor nerve - directly or via several switches - so the stimulus directly triggers movement.

However, in the other cases, the communication network between the stimulus and the movement includes the brain, where the stimuli enter and from where the instructions for movement start. Even for most of the already practiced, automatic movements.

An area of the cerebral cortex called the motor cortex is responsible for moving muscles. Here, every muscle that can be moved voluntarily has its own area from which the movement starts. The size of these areas does not depend on the size and mass of the muscle, but on the direction and fineness with which the given muscle can move. For example, the thigh muscle makes up a fairly large percentage of the body mass, but its movements are relatively simple. So the brain area responsible for its movement is much smaller than the part that moves the diverse and delicate muscles of the hand.

The size of these areas varies from person to person, depending on how we use our body. The innervation area of a violinist's hand is much larger than that of a professional boxer. The brain develops the area we use according to how we use it.

This already shows that the activities we perform regularly, the movements we learn, how regularly and with what fineness we use them, have an effect on our brain, and with this we can also affect the development of our body.

It can be noted that in most cases the stimuli are also experienced through movement. The eye notices first the difference, the change; touch conveys a stimulus from a surface when we stroke it with our finger; our sense of smell and taste are related, it is also

characteristic of this complex perception that we experience it as a stimulus through them when there is a change in it, and if a taste or smell becomes permanent, we do not experience it as a stimulus after a while; our hearing senses sound vibrations, that is, movement. Proprioception, i.e. position perception, can also be interpreted as a stimulus when there is a change in the position of the body.

Since all sense organs are connected to the brain as a central organ, in a certain sense it can be considered that the brain itself is the central sensor, of which the individual sense organs are extensions and sensors for receiving various types of stimuli. Although the senses are constantly in contact with various stimuli from the outside world and register them continuously, the brain only pays attention to them when they change, or when they change to a certain extent. There is a difference between resting our eyes on a continuous, monotonous and slow-moving image (e.g. a field of wheat swaying in the wind, or rushing traffic on the highway), or experiencing sudden movement different from its surroundings (e.g. the sudden appearance of a predator, or a flashing ambulance). So from this point of view, it can also be said that experience requires movement and change.

## 2.5. Development of the brain

Considering the complexity of the nervous system, it can be said that it is also related to movement.

Animals that do not move their whole body (sessile animals) have a very simple nervous system. Ascidians, for example, still have a spinal cord and a tail in their larval stage, but once they have found a suitable place to settle, they lose both because they no longer need them. Animals that have relatively few and not diverse body parts to move have a diffuse nervous system[6] or a peripheral nervous system[7].

Vertebrates, including humans, have a nervous system, the complexity of which largely depends on how we use our body, how complex the movement of the body and its various parts is.

During our fetal development, the human nervous system is created by first forming a tube, the end of which swells. The brain develops from the swollen end, and the spinal cord from the straight end. The development process is complex, and it does not end with birth. Newborns still have very little active brain function, the motor functions of small children (breathing, swallowing, etc.) are reflexive. Unlike, for example, ungulates, which

[6] *e.g. cnidaria and jellyfish, where the body is networked by equal nerve cells: if a stimulus hits somewhere, it spreads throughout the body*

[7] *earthworms or arthropods, where nerve cells are packed in clumps, they are responsible for processing stimuli and initiating reactions*

are able to stand on their feet after birth, the movement of a newborn baby is still quite limited.

The development of movement is initiated by the development of the senses and the effects of the stimuli that reach it through them. Simply put: the newborn is curious and wants to discover the world around him, the movements and changes around him - and this requires movement.

As it was mentioned before, movement is necessary for the experience. From another perspective - and this can be highlighted from the point of view of the child's development - movement is also necessary in order to have as many stimuli as possible. That is, our natural and innate curiosity drives us to go where things happen. On the one hand, this curiosity leads us to develop our movement in childhood. The child looks for stimuli, wants to reach things, and for this purpose tries to carry out certain movements (raising and holding the head, leaning, crawling, climbing, etc.).

The result of healthy movement development is a healthy locomotor system and nervous system, which, as described earlier, affect each other back and forth. If a learning phase is missed, it can be seen both on the movement and on the neural functions.

## 2.6. The development

The model of *The Theoretics* also discusses the functioning of development as an individual's intellectual ability. According to the model, development is a conscious change: it can take place if the individual himself decides in favor of the change.

On the one hand, it is conscious, that is, the individual initiates it. On the other hand, it is alteration, change, that is, action. Development does not result from habit or a reaction to certain stimuli.

The development is defined by five interdependent basic conditions as follows.

Attention: development can take place where attention is directed. If the focus in a game is on strategy, strategic thinking can develop, if it is on movement, that is where there is room for improvement.

Tension: change requires energy and tension. The desire to win and the stakes involved can provide the necessary tension in a game. But it can also be understood that all of these are tools to connect with the already existing tension necessary for change.

Tool: development takes place using a tool. The tool can be the movement, it can be a game rule, it can be certain elements of a game, etc.

Work: it is necessary to use the tool to work with the tension in order for the change to take place - all this so that the attention remains on what we want to develop.

New path: finding and observing new opportunities in the process. It is possible to improve in a game when we experience and then try new things based on the conclusions drawn from the experience. During exercise, if we try new movements and observe them, or if we try the same movement as before, but this time as a novelty, we also keep our attention on the movement, observe and understand how the movement takes place.

As can be seen from the above, either an exercise method or a game can provide a framework for development. In fact, any activity during which the above conditions can be met.

# 3. CORRELATIONS AND POSSIBILITIES OF PHYSICAL-MENTAL DEVELOPMENT

## 3.1. Correlations between movement and thinking

The brain is the central control organ for movement, but also for thinking. Movement and thinking – since they are the same organ – are necessarily related.

As you can see, movement is related to experience, experience to thinking, thinking to movement. We need to move in order to experience, experiences provide the basis for thinking. Actions, the manifestations of the will come from thinking, are also done through movement.

Moreover, thinking itself can be considered as movement, since we move images on a mental level - we arrange, group, and move them.

Since both physical and mental movement are controlled by the same central part – the physical-mental part, i.e. the mind – the two necessarily share similarities. Fast movement (as long as it is not reflexive) is accompanied by fast thinking, fast thinking results in fast movement. Organized thinking leads to organized and deliberate movement, well-organized movement also contributes to organizing thoughts. If we narrow down the possibilities of our movement, our experience and thinking can also be narrowed, if we open up new possibilities in our thinking, our movement can be more open and multifaceted. Movements that require a sense of rhythm (e.g. table tennis, dance) develop thinking skills that also require a sense of rhythm or proportion (e.g. mathematical skills) (Buzsáki 2006; Thaut 2005; Grahn 2007).

Based on the model, the two areas – the physical and the mental level – are related to each other and constantly interact with each other. Physical development also develops the mental level, mental development also affects the development of the body, and vice versa: physical decline is accompanied by mental decline, and the neglect of mental

abilities also affects the physical level. To what extent and exactly how they interact can be the subject of further investigations[8].

However, it can be assumed that if the two areas are developed at the same time, due to their mutual influence, the development will be realized much more efficiently than if the areas were developed separately. So methods suitable for both physical development and contain appropriate movement elements, as well as require thinking skills, due to the synergy, will enable more effective development in both areas than if they were only focused on one or the other area.

The purpose of this project is to investigate the effectiveness of the joint development of the two areas.

During the I.M.Health project, two types of methods are investigated.

One is a therapeutic exercise and training method (Balance[2]), which is a special movement system containing movement sequences for restoring the body's balance. Certain forms of Balance[2] are successfully used in locomotor rehabilitation, other forms are used in daily regular exercise (in various difficulty levels) and in the preparation of athletes.

The other is Water Skyball (WSB), an aquatic team sport. WSB is played in waist-deep water, with special equipment (split goal, balls made for WSB, a pool divided into three zones), with special rules. Moving in water is a unique exercise compared to other sports, and handling the ball also requires a specific technique. The rules exclude physical contact, so dexterity and strategic-tactical solutions are supported in addition to physical exercise. It challenges both physical and mental abilities.

*[8] According to our assumptions, the unilateral development of any area can to a certain extent "pull up" the other area as well, however, this unilateral development has serious limitations. It is likely that in order to achieve a healthy balance, continuous development of both levels is necessary.*

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