

# A New Unique Magnetic Treatment Method in Physiotherapy for Body-educational Healing: Observations on Algodystrophy of a Knee Joint

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## Abstract

The central question in this study is how controlled physiological processes should be used in physiotherapy. The main finding and its importance is that controlled physiological changes in homeostasis should be used by educating and training the patient's healing in these conditions.

This article reviews the physiological reasons for using the homeostatic processes in the damaged human body and the application of physiological manipulations on patients with the aim of increasing the treatment results and the clinical significance of the physiotherapeutic impact, and more specifically in the case of the use of already widespread magnetotherapeutic methods.

Therefore, the new physiotherapeutic, physical impact proposed has two components-on the one hand, appropriate physiological manipulations with homeostatic changes, and on the other – simultaneous standard magnetotherapeutic procedures.

An example of the application of the impact on human limbs-treatment of algodystrophies (in diseases and injuries) of the knee joint by physical training impact-Lekcionem Human Corpore. In this case, the physical training impact has two components-external, cuff-dependent occlusions and reperfusions of the blood circulation of the limb proximally to the focus of the disease (about 2 to 4 cm proximally to the kneecap on healthy tissues) and the external magnetic impact on the focus and the adjacent healthy tissues.

Summary comparison of treatment effectiveness-in the main group patients, in comparison with the control group patients were obtained clinically significant, clearly visible positive results, restoration of normal or sufficiently close to normal vital functions and activities, and practically completely acceptable increase in their quality of life.

The physiological approach in physiotherapy consisting of controlled, educational changes and homeostasis processes in the damaged part of the human body achieves remarkable, positive, clinically significant healing results.

## Introduction

### Biological position

If exposed to any extraordinary, unexpected and/or unknown stimulus (which is also typical of the occurrence of any pathogenic phenomena), the organism responds in multivariate and polyvalent ways.

Healing processes are an elite positive component selected by the organism, resulting from a large number of simultaneous and/or consecutive iso-physiological processes and isomorphic and iso-functional metabolic chains. These isophysiological processes and metabolic chains are self-organizing as a primary response of the body to its damages [1-3]. What all iso-physiological processes, isomorphic and iso-functional metabolic chains have in common is that they are prototypes of healing processes. One of the characteristic features of the multiple prototypes is – depending on the conditions in the body and the quality of its life activity - that in addition to the positive healing processes, incomplete and imperfect processes, as well as incomplete and incomplete metabolic chains, develop simultaneously and in parallel with them. Therefore, healing can be perfect or imperfect, complete or incomplete (partial).

### Medical Position

Medical assistance for an injured human organism (for example, algodystrophy of knee or elbow joints) aimed at creating and selecting prototypes of the healing processes in the body [4].

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Multiple different types of medical assistance are used in the above-mentioned cases of patients with algodystrophy of knee or elbow joints [5].

Here I will describe a new method of medical assistance - treatment of the injuries to the human body described above.

The new method is aimed directly at the self-organization of the isophysiological processes and the isomorphic and iso-functional metabolic chains of the prototypes of healing processes [6].

The essence of the new method is the training impact with artificially created (inside the organism), additional, auxiliary and educational isophysiological processes, isomorphic and iso-functional metabolic chains[7,8]. These auxiliary and training processes and metabolic chains are more successful analogues of the body's own prototypes (i.e., the ongoing imperfect and incomplete healing processes and the unclosed and incomplete metabolic chains, before the physical training impact)

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in the self-organization of the healing processes. Analogues are combined and superimposed on the natural self-training processes in the self-organization at all morpho-functional levels in the healing processes of the body.

The possibility of a medical impact arises from the interaction between the natural processes in the body achieved by this method and the externally applied impact on the general biological mechanisms of training, memory mechanisms and their expression as functions and structures. That is, the body achieves reception and assimilation of the external medical impact with permanent changes in it [9].

## Methods

### Physical training impact for treatment of injured limbs of the human organism to support the body – educational healing

An example of the application of the impact on human limbs - treatment of algodystrophies (in diseases and injuries) of the knee joint by physical training impact - Lekcionem Human Corpore. In this case, the physical training impact has two components - external, cuff-dependent occlusions and reperfusion of the blood circulation of the limb proximally to the focus of the disease (about 2 to 4 cm proximally to the kneecap on healthy tissues) and the external magnetic impact on the focus and the adjacent healthy tissues [10-13].

The devices and tools necessary for the exemplary impact on the human limbs and their methods of use determine the operations of the medical professional who is treating the patient (hereinafter referred to as tutor). The way of using the devices and tools is a specific sequence of usual medical operations.

A pneumatic tourniquet – a pneumatic cuff sphygmomanometer is used for routine and standard measurement of arterial blood pressure to carry out operations for external cuff-dependent occlusions and reperfusion of the blood circulation of the limb. Through a series of stepwise gradient-increasing changes in the cuff pressure, the tutor achieves stepwise increasing occlusions of the limb circulation, distally to the site, where the sphygmomanometer cuff has been placed. The maximum cuff pressure is determined by the tutor. It is usually close to the patient's systolic pressure measured by the Riva-Rocci's method. The tutor achieves gradient-escalating reperfusion through a series of gradient-descending cuff changes after reaching the maximum [14,15].

The minimum pressure in the cuff is 0 mm Hg. The difference between two adjacent steps of the pressure is determined by the tutor and is usually 5 to 10 mm Hg.

The pressure in the cuff, typical of each step of the ascending or descending sequences, is maintained by the tutor for a time determined by him (usually 2 to 3 minutes) [17-19].

Changes in the cuff pressure from minimum to maximum or vice versa form a sequence of pressures that is repeated many times during the training treatment procedure. There is a period between two sequences - a pause, also determined by the tutor (usually 2 to 5 minutes). A sequence of the previously described changes in the cuff pressure combined with a time-pause form a cycle. A cycle can be more complex and contain more than one type of sequence and also be a combination of sequences. Several consecutive cycles of pressure changes in the cuff together with a parallel magnetic impact on the injured area and the adjacent healthy tissues form a training procedure. The training procedure is fundamental and crucial for the training test in the human body training [20].

The magnetic impact simultaneously involved in the cuff pressure cycles (i.e., involved in the occlusion/reperfusion cycles and their time-pauses) is the second major component of the physical training impact. The only precondition for the properties of the second component of the two-component physical impact – the magnetic field, is to affect in a multivariate and heterogeneous way the body homeostasis in the damaged area and/or the general homeostasis processes in the body. The criteria for evaluating the impact on the homeostatic status of the patients depend on the technological capabilities of the attending medical team [21-23].

The tutor's magnetic operations are: arranging and fixing electromagnetic inductors or permanent magnets around the diseased area and the adjacent healthy tissues. Electromagnetic inductors and permanent magnets are the impacting tips on the human body of common medical devices and magnetic therapy tools [24].

The magnetic component of the impact as the second component of the physical training impact has a supporting and logistical role in the body's response to the first foundational component of the physical training impact – namely, the cuff occlusion described above and reperfusion of the limb distal to the site of the injury [25]. More specifically, the magnetic component has a role in the physiological effects of the body to the conditions of occlusion and reperfusion of limb circulation [26,27].

Maintenance and logistics of the magnetic impact is manifested by a priority (compared to the body's reactions to standard magnetotherapy) perception and assimilation of the magnetic impact by the body in its physiological effects to the occlusion and reperfusion of blood circulation.

The primary, direct goal of the physical training impact is to achieve vital changes in homeostasis in the tissues of the learning sick human body, distal to the applied pneumatic cuff (for homeostasis - see below). But the ultimate goal of the physical training impact - conducted in the form of a lesson on the sick human body, is the body's response directed and prepared by the tutor [28].

In general, the body's response to the two-component physical training impact is expressed in the progress of dominant physiological processes in the focus of disease and in the adjacent healthy tissues, as the organism switches to a new working mode.

The dominant physiological processes of the body and its new working mode are the reason for the occurrence and progress of new and more successful healing processes (see below) [29].

### Organization and implementation of physical training impact on a sick human organism

Lesson on human body (LEKCIJONEN HUMAN CORPORE) - treatment with physical training impact. The tutor, in his role of a teaching and treating subject, through the above medical operations of physical training impact, gives a lesson on the sick person's body in the form of an educational and training test [30].

The physical training impact is organized as training by conducting lessons in the form of educational and training tests. These training tests are created by the tutor's mechanical and magnetic operations described above, which represent sequences of tasks - exercises with various values of important homeostasis constants for the sick organism [31].

The subject and purpose of the training test are the artificially sequences of values of homeostasis constants achieved by the tutor, such as - saturation of blood and tissues with oxygen, saturation of blood and tissues with nutrients, blood and interstitial fluid pH, intravascular blood pressure (arterial, capillary and venous), tissue pressure dynamics etc.

Thus, the test is based on selected sequences of physical changes of important, major (disease-significant) homeostatic constants. These constants are created by the tutor in the ongoing physiological processes in the focus of disease and the adjacent healthy tissues. Also, these constants are crucial and defining for the pathogenetic chain. On the one hand, they are common for the causes and etiology of the disease, and on the other, they are constituents of the physiological foundations of the educational training test [32].

The sick human organism responds to the educational training test by striving to maintain its homeostasis or go into a state of allostasis, forming isophysiological processes and switching to isomorphic and isofunctional metabolism. Thus, based on the achieved temporary changes of the homeostatic constants, the organism begins the creation and maintenance of isofunctional and isomorphic metabolic chains and isophysiological processes. These new metabolic circuits and physiological processes are artificially and purposefully induced analog prototypes of the naturally occurring long-lasting but imperfect healing processes and their incomplete and unfinished natural prototypes.

When conducting the tests, the tutor's aim is that the body responds to the physiological processes in the focus of disease and the adjacent healthy tissues through effective adaptive changes in the course.

These adaptive changes in the physiological processes, including adaptive changes in the limit values of the constants, are usually obtained after several repetitions of the tests during the day and during the entire course of treatment. These repetitions are the basis of the training of the body to heal itself [33].

Here is one of the possible explanations for the body's acquisition and selection of adaptive, effective physiological processes: of the multiple isomorphic and isofunctional metabolic chains and isophysiological processes that have come into being, only those that manage to close a complete metabolic and functional cycle end exhaustively and definitively. Most often, due to the substrate depletion of the above-mentioned metabolites, the organism selectively stimulates their production, simultaneously suppressing the production of the remaining isomorphic and isofunctional metabolites, as well as the course of the remaining isophysiological processes. This happens more and more visibly and in contrast when conducting each subsequent training test (lesson). Over time and training, the body's memory and structural mechanisms are activated. Thus, during training, the organism repeatedly enhances and expands the restoration of homeostasis to the extent of allostasis, creating synergistic and analogous isophysiological processes, isomorphic and isofunctional metabolites in its healing processes. That is, the body switches to a new working mode, in which more successful healing processes are possible and occur - healing with a new quality takes place [34].

On the one hand, during the educational and training test, the tutor, through his force operations, causes the body to maximally expand the homeostasis limits, including until allostasis occurs [35].

On the other hand, the physiological training impact, especially through the included magnetic force component, supports the body in its processes of homeostasis recovery to the extent of allostasis. More specifically, it supports the body, which perceives and assimilates it, and which more successfully forms isomorphic and isofunctional metabolites and carries out synergistic and analogous isophysiological processes [36].

Thus, when using the second component (the magnetic one) of the physical training impact, the cuff-induced oscillatory changes (i.e. the first component of this impact) can be not only partially perceived or even neutralized by the body, but these magnetic conditions actively and effectively are used more easily and more successfully by the same body - to achieve another more adequate balance of its homeostasis and build a higher level of its self-organization (healing).

In general, in the method of training on the patient's body - if a cuff is used alone - the dependent occlusion/reperfusion of the peripheral blood supply - the resulting changes are isolated, limited, or neutralized by the body, while with the simultaneous use of additional external magnetic activity, the same oscillating changes are extended and developed by the evolutionarily created biological mechanisms in a new quality for this organism, i.e. reorganization of the healing processes is underway [38].

Thanks to the proposed method (algodystrophies of the knee joint in the case described here), in the areas of the dystrophic intra-articular loci and around them, tissues are reorganized and sanogenic antihypoxic and antihypotrophic sources and self-organizing factors of restorative and adaptive processes occur.

Statistical methods and observations on the medical effectiveness of the application of the two-component physical impact during the performance of medical and educational activities organized according to the original method "lesson on the human body - Lekcionem Human Corpore" method on patients with algodystrophy of one knee joint. A double-blind study.

## Objectives

One of the objectives of this study is to determine the clinical relevance and contribution of the use of the two-component physical treatment, including a magnetic therapy component, to the physical training on the patient's body as a new type of physical treatment. And more specifically, make comparison with the well-known effectiveness of the standard, low-frequency, pulsed, electromagnetic therapy in patients with algodystrophy of the knee joint, used worldwide.

Another goal of the study is to evaluate the attitude and tolerance of patients with this disease to the use of the first component of the two-component physical impact, namely the controlled, educational, sparing (low-level, gradual and short-term) occlusion and reperfusion of the patient's limb damaged by the disease, repeated during the application of the electromagnetic impact (the second component of this two-component physical impact). The study also focused on the task of establishing whether there is any dynamics in the patients' tolerance to the second component of the two-component physical impact. It also observed the nature of the change in the dynamics of the tolerance and established whether the electromagnetic impact has a characteristic and regular influence on this tolerance [39].

Selection of patients suitable for statistical processing and selection of methods for assessment of disease manifestations and their

comparative analysis depending on the treatment results obtained. The patients were selected in compliance with the requirements for patients' information and consent and in accordance with the rules of the medical ethics committee.

As to achieve the goals and objectives defined above, I selected two main groups - first (1) and second (2) group with 94 patients in each of them. Patients in both main groups had algodystrophy of one of their knee joints for more than a year. All patients were examined multiple times by orthopedic specialists, who determined their diagnosis, which in all cases was radiologically objectified. They have been treated repeatedly with temporary and unsatisfactory result. Treatment in 83% of the patients in each group is conservative - medication, physiotherapy and rehabilitation, and 17% of the patients in the groups (with post-traumatic algodystrophy) also had surgical intervention - meniscectomy or metal osteosynthesis for intra-articular fractures.

The distribution and number of the patients with the same origin and mechanism of development of algodystrophy, as well as the severity of the disease before this study (assessed by the WOMAC test, VAS and the Likert scale) in the two main groups were the same.

The patients in each main group were further divided into two groups named active (A) group and control (C) group with 47 patients in each of them.

Four groups of 47 patients were formed and numbered as follows - 1A, 1C, 2A и 2C. The treatment impact was performed on the patients for 45 minutes, once a day, for 14 days in all groups.

### Methods application actions

Treatment was administered as follows:

Group 1A: Two-component physical impact in the form of "lesson on the human body";

Group 1K: Placebo two-component physical impact, with electromagnetic inductors demonstratively placed around the damaged knee joint, but not working;

Group 2A: One-component physical impact with working electromagnetic inductors around the damaged knee joint;

Group 2K: One-component physical impact, which consisted only of the mechanical manipulations of the tutor (medical professional conducting the treatment), representing periodic and temporary changes in the pneumatic pressure of the cuff of the sphygmomanometer according to the methodology of one-component, mechanical impact similar to the mechanical component of the two-component "lesson on the human body". In this group, patients did not have any electromagnetic inductors placed around their damaged knee joint or elsewhere on their bodies.

The patients and the medical professionals conducting the physical procedures and evaluating the initial conditions and results achieved for the patients did not know the composition of the patient groups and the actual working modes of the physiotherapy equipment.

### Results and Discussion

Summary comparison of treatment effectiveness in group 1A versus group 2A - the group 1A patients had clinically significant, clearly visible positive results, restoration of normal or sufficiently close to

normal vital functions and activities, and practically completely acceptable increase in their quality of life. Patient tolerance to the manipulations inducing occlusion and reperfusion of the affected limb increased during each subsequent procedure. This was also achieved probably due to the occurrence of remarkable positive clinical results from the patients themselves.

Treatment effectiveness assessment in group 1C - clinically insignificant improvement in only 12% of cases. Very poor tolerance to the manipulations of occlusion and reperfusion of the affected limb - patients tolerated pressure values of only 60 - 80 mm Hg in the pneumatic cuff for a very short time; patients wanted long breaks between the cuff inflations. Four patients withdrew from treatment within the first three days and another seven patients withdrew by Day 10. Only 29 patients completed the course of treatment.

Treatment effectiveness assessment in group 2C - fluctuating and minor clinical improvement in 3% of cases. One patient dropped out on Day 3.

### Conclusion

The physiological approach in physiotherapy consisting of controlled, educational changes and homeostasis processes in the damaged part of the human body achieves remarkable, positive, clinically significant healing results.

### Competing Interests

The authors declare that they have no competing interests.

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