

## Optimization of quality of functional improvement – aspects of psychomedical treatment

### *Optymalizacja jakości usprawniania funkcjonalnego – psychomedyczne aspekty leczenia*

Małgorzata K. Szerla<sup>1,2</sup>, Jacek Wąsik<sup>3</sup>, Dorota E. Ortenburger<sup>3,4</sup>, Michał Gwara<sup>5</sup>, Bartosz Trybulec<sup>5</sup>

<sup>1</sup>Department of Anaesthesiology and Intensive Care, The Provincial Specialist Children's Hospital, Kielce, Poland

Head of the Department: Małgorzata Szerla MD, PhD

<sup>2</sup>Department of Emergency Medicine, Institute of Public Health, the Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Poland

Head of the Department: Prof. Sjarhei Panko MD, PhD

<sup>3</sup>Institute of Physical Education, Tourism and Physiotherapy, The Faculty of Pedagogy, Jan Długosz University, Czestochowa, Poland

Head of the Department: Prof. JDU Jacek Wąsik PhD

<sup>4</sup>The Pain Treatment Centre, City Polyclinic Hospital, Czestochowa, Poland

Head of the Centre: Wojciech Konieczny MD

<sup>5</sup>Institute of Physiotherapy, Jagiellonian University Medical College, Krakow, Poland

Head of the Department: Jan Bilski MD, PhD

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#### Abstract

Literature on the subject and clinical practice indicate that the improvement of an individual's psychophysical functioning encourages multiplying and strengthening positive therapeutic effects. Approaches of Western and Eastern culture (selected aspects) have been included in deliberations on this issue. The purpose of this study was to adopt a multi-dimensional approach to improving functional efficiency through optimizing locomotion in the comprehensive treatment of the patient. The paper is the authors cognitive analysis based on the literature on the subject, including each author's own approach to clinical practice located at the interface of medicine, physiotherapy and psychology. Optimal functioning improvement considering the individual context of each patient is a common objective of the interdisciplinary therapeutic interaction. Obtaining maximum effectiveness in therapy is associated with enormous effort, complex skills, predisposition and other factors, which are the subject of growing scientific knowledge.

#### Streszczenie

Pismienictwo i praktyka kliniczna wskazują, że poprawa funkcjonowania psychofizycznego człowieka sprzyja pomnażaniu i utrwalaniu pozytywnych efektów leczenia. W rozważaniach nad tym zagadnieniem uwzględniono wybrane elementy podejścia terapeutycznego kultur Zachodu i Wschodu. Celem prezentowanej pracy jest przedstawienie propozycji wielowymiarowego podejścia do podnoszenia sprawności funkcjonalnej poprzez optymalizację ruchu w kompleksowym leczeniu pacjenta. Artykuł jest efektem analizy poznawczej opartej na literaturze przedmiotu, z uwzględnieniem elementów własnego podejścia do praktyki klinicznej ułożonej na styku medycyny, fizjoterapii i psychologii. W interdyscyplinarnym oddziaływaniu terapeutycznym wspólnym celem jest optymalne usprawnianie funkcjonalne, uwzględniające indywidualny kontekst każdego pacjenta. Uzyskanie maksymalnej skuteczności terapii wiąże się z olbrzymim wysiłkiem, złożonymi umiejętnościami, predyspozycjami i innymi czynnikami, będącymi przedmiotem rozwijającej się wiedzy naukowej.

*Mental capacity develops on the basis of the mind's recognition and awareness of physiological function. The physical body is the prototype.*

Eugenio Gaddini [1]

#### Introduction

According to the biopsychosocial model, individuals are active processors of information and not

passive reactors. Similarly to specific places rooted in each individual biography, education is rooted in the landscape of human existence – it designates specific choices, chances and opportunities which an indi-

vidual encounters in his life [2]. This refers both to healthy individuals undertaking moderate activities or to professional athletes as well as to ill individuals – patients, who laboriously try to recover psychomotor aptitudes for functions which they have lost.

Current knowledge within basic medical sciences referring to the essence of an individual's functioning (e.g. anatomy, physiology, biophysics, biochemistry) joins specialists of many medical disciplines who deal with the therapeutic influence on human nature.

Experience resulting from the clinical practice of the authors of this article suggests that the aim of therapeutic influence should involve two basic elements: (1) striving for proper functioning so that the body can achieve functional balance – the so-called functional homeostasis; and (2) continual consideration of current psychomotor aptitude of a healthy individual (e.g. a sportsman), and of an ill individual. If a capacity disorder appears in the body, an ultimate goal of clinical proceedings should be to seek to restore homeostasis, understood as a capability to maintain dynamic balance in the environment where biological and psychological processes occur.

Relative balance is maintained in a functioning body through a negative feedback loop – a factor stimulating its function has a positive effect on an inhibiting factor, while an inhibiting factor has a negative effect on the stimulating factor. Such a dynamic (i.e. unstable) system allows a relatively stable state of psychomotor functioning to be maintained [3].

A traditional division of therapeutic methods distinguished symptomatic treatment (relieving illness symptoms) and causal treatment (removing the cause of the disease). Activities targeted in such a way, although justified, are often directed against nature, particularly when they interfere with internal mechanisms responsible for maintaining homeostasis. An example of this situation may be a systemic infection in the course of which most symptoms indicate determination of the body aimed at maintaining internal balance under new conditions. Hence balance should be maintained between justified, but unnatural activities and therapeutic activities following the patient's psychophysical capabilities.

Stimulation, controlled and regulated by the central nervous system, plays a key role in the human body in the normal course of mental and somatic processes. The knowledge of physiology of this phenomenon is commonly used in psychophysical rehabilitation methods. During the activating (stimulating) impact of properly selected physical factors (physiotherapy) and/or psychological factors (psychotherapy) on inhibiting factors in the body (i.e. limitations resulting from incurred post-traumatic injuries or from the underlying disease), balance may establish itself automatically – on the basis of the negative feedback loop. Physiological and behavioral

mechanisms producing and stimulating responses to the stimulating factor participate in this process and, additionally, neuromodulation of such a process consists in the fact that the integrating centre (hypothalamus) forces the effectors to respond in a way which is possible in the current state of psychomotor capacity of the body.

In recent years, technologically advanced societies have undergone significant changes with respect to arrangement of lifestyle. Physical activity has been reduced dramatically. Refraining from physical activity adversely affects not only the development of motor skills of an individual. The length and the quality of life depend to a great extent on maintaining balance between somatic and psychological components in functioning of a human as an individual entity [4, 5]. A proper course of metabolic processes is conditioned by ensuring adequate motor stimulation. In contrast, lack of such stimuli negatively affects a person's psyche and ability to relieve stress [6, 7].

Both reliable scientific research and clinical practice suggest that an interdisciplinary approach to solving problems connected with improving psychophysical functioning of an individual (in health and in disease) broadens the scope of opportunities and strengthens therapeutic effects [8].

The aim of the authors of this study is to outline an interdisciplinary and multidimensional approach towards improving functional capacity of an individual, at the junction of medicine, physiotherapy and psychology. Opportunities for increasing functional capability in the context of movement optimization were taken into consideration. Philosophical approaches of the West and the East were considered as well, for example an idea of functional efficiency of an individual derived from Korean taekwondo.

### **Managing compensation in improving physical fitness**

Automatic compensation is a natural response of the body to changes occurring in it. Very often in this mechanism the body burdens another system too much, which causes further therapeutic problems and secondary pathological states.

An example may be lateral spinal curvature. Each lateral deformation of the spine above 10° is referred to as scoliosis. The result of compensation of spinal curvature is asymmetric arrangement of various biomechanical points of the body, but the effect is that the whole system is more or less balanced, which secondarily may lead to pathologies within internal organs [9, 10].

The aim of the interdisciplinary team should be to properly manage the compensation of the body in such a way that a state similar to the initial condition of the body is achieved, or at least a state as functional as possible. At the same time it should be noted that

an ideal state cannot be achieved because one of the systems will always be burdened and regenerative capacity of the body within the motor system is not enough to fully compensate the imbalance. However, having proper knowledge and instruments from areas such as medicine, physiotherapy and psychology, we are able to adequately manage mechanisms which affect this balance. This aim can be achieved through movement optimization using physiotherapy, stress reduction and proper pharmacotherapy [11, 12].

### **Stress as a reaction to requirements faced by the human body**

The requirement of an individual (whether healthy or ill) to fulfill duties always evokes the same defense reaction. It is stress, i.e. a state of increased emotional tension, accompanied by somatic reactions caused by the neuroimmune-hormonal response of the body. If the stress reaction is disproportional (insufficient or excessive) to the actual situation and to current capabilities of an individual, it may lead to a dissonance or even to a threat of maintaining homeostasis.

Any "requirements" imposed on the body cause simultaneously: psychological stress (changes occurring at the level of regulating mechanisms, in the emotional-motivating area of the central nervous system) and biological stress (including all the autonomic reactions occurring in the body). The response of the body to stressful conditions is controlled by the sympathetic part of the autonomic nervous system and by the endocrine system of the hypothalamus-pituitary-adrenal axis. Once the sympathetic system is activated, immediate physiological reactions take place: tachycardia, tachypnea, and redistribution of blood flow (blood outflow from the skin to the skeletal muscles). The effects of activating the hypothalamus-pituitary-adrenal axis appear much later (up to several hours after triggering the activating factor), and they persist for up to a few days [13].

### **Optimization of psychophysical improvement – multidimensional approach of the West and the East**

Regaining, maintaining and improving a functional capability may be effective only when it is based on comprehensive activities of specialists from many areas oriented at an individual therapy of a specific person.

This denotes personalized activities based on joint arrangements made between the therapists and an individual sportsman and/or an individual patient. However, detailed criteria (indicators) of each set goal should be agreed on, together with the acceptable cost which can be borne by the body. It is about optimizing therapy, i.e. gaining maximal effect with minimal loss of energy.

Research on methods of improving functional capability, a significant aspect of which is movement optimization, is bringing more and more new findings from around the world [14–17].

*It is noticeable that the concepts concerning human psychophysical improvement deriving from the East and from the West correspond well with each other. The rule "maximum gain with minimum effort", which is well known in physiology and respected in biomechanics, is clearly visible in taekwondo, a Korean martial art in which parts of the body (especially the hands and legs) perform each movement with maximum efficiency. It is confirmed by research in the area of biomechanics which in detail identifies small elements which may improve movement efficiency [18–21].*

The name taekwondo reflects its idea to let the body be controlled by the mind and to shape oneself through the martial art training. Current studies prove that outstanding results in sports are achieved by athletes who are professionally prepared for competing, both physically and intellectually.

In the case of healthy people doing martial arts, whose activity takes place in the zone of very high psychophysical capacity, the process of optimization of psychomotor improvement refers to a different boundary of physical and mental capabilities than in an ill person. An ill person or a person suffering from serious posttraumatic effects, or who has just ended the process of active treatment, possesses a drastically lower starting level of psychophysical capabilities than he did when he was completely healthy.

In both of those distinct situations (sport and therapeutic) the issue of selecting improvement meters and objective evaluation of achieved progress plays a significant role.

Therefore, in the analysis of conditions optimizing a patient's movement, a starting level of his psychophysical capacity should be considered, extending between the zone of reduced capability caused by pathological factors and the zone of the highest capability (the so-called special capability).

Any physical activity of an individual is based on complex neurophysiological processes, being a specific and an extremely valuable indicator of the condition of the body.

Biomechanics (mechanics of living organisms) as an interdisciplinary field of study of movement and its mechanisms is applied in sports, physiotherapy and medicine.

Application of biomechanics in sports involves testing and modeling movement of the player performing exercise and activities connected with a specific sport discipline in order to improve and optimize the movement technique, e.g. the stroke or jump technique and others [16].

In Choi's (1995) description concerning the eastern concept of taekwondo, a rule of *maximum gain*

*with minimum effort* may be seen very clearly as a criterion for optimization of psychomotor improvement [16, 17].

Modern achievements of science and philosophy of the East provide the applicable knowledge for the benefit of common therapeutic activities of specialists from many medical professions of the West. Therefore, biomechanics and physiology, being fields of study of the West related to the psychomotor functioning of an individual, constitute an intellectually complementary bridge between the East and the West.

In the case of the martial art taekwondo, a physical activity of an athlete-warrior takes place in the zone of very high psychophysical capacity. Of course, the movement optimization process of a sportsman will refer to an entirely different goal (achieving the maximum psychophysical fitness) than in a patient with a reduced psychophysical fitness.

However, in spite of obvious differences in starting conditions of psychophysical capacity, common points may be found. The improvement of psychophysical functioning in martial arts can be regarded as a sum, or rather a function, which is influenced by a number of factors, such as effort and skills of a training participant, commitment and competence of a trainer, as well as internal (personal) factors such as psychological resilience, perseverance and external (contextual) factors such as social support. This is also the case in a therapeutic situation of a patient, in which achieving the desired effect (i.e. improvement of efficiency of the body and restoring the pre-disease efficiency) depends on the influence of a number of individual factors [8].

The matter of selecting measurable criteria of improvement as well as evaluation methods of achieved progress in the area of functional capability plays a key role in both of those situations (therapeutic and sport). The initial level of capability and/or psychophysical incapability should be taken into account. The selection of methods and tools used for movement optimization is vital as well. These range from pharmaceuticals and kinesiotherapy, through physical education measures, to techniques and training methods applied in professional sports.

In the case of a professional athlete, the movement optimization in taekwondo refers to an individual who initially finds himself in the zone of the highest psychophysical capacity. However, when an individual suffers from an injury, his fitness may visibly deteriorate, and he will immediately become a patient to whom it will be a challenge to regain functioning from another (lower than professional) level of psychophysical fitness. He faces a situation referred to in the literature as “steps of psychophysical fitness” [22].

Then, as in the case of any other patient, the sportsman’s recovery to the pre-injury fitness level will become strenuous climbing upwards, upon further steps

of physical activity. Travelling the path of regaining psychophysical fitness and effort exerted during the way always constitute some achievement, comparable to a sport success.

Professional training of an athlete consists of comprehensive and interdisciplinary assistance in exceeding his foregoing achievements within his *highest (special) psychophysical fitness*. In a situation when a sportsman suffers an injury and becomes a patient, each stage of regaining the basic fitness level turns into a challenge. In this case a therapeutic team (physiotherapists, doctors, psychologists) help him regain what was lost, trying to follow his current psychophysical capabilities. Both in the case of applying physiotherapy and using methods of training art from Eastern philosophy, a common approach involves continual evaluation of the capability level of an athlete and/or a patient, which in the case of capability level is lowered. It is referred to as *the zone of reduced psychophysical fitness*. In both circumstances, (1) assisting the athlete in achieving the highest possible results in professional sport and (2) “taking the patient out” from the zone of reduced psychophysical fitness biomechanics (closely related to kinesiotherapy) provide the appropriate course of action for the improvement procedure [22].

### **Psychomotor improvement of patients treated in intensive care units**

Technologies introduced into intensive care have undoubtedly brought about significant progress in achieving better results in terms of treatment and survival. Sometimes it happens at the expense of deteriorated psychomotor functioning. Many scientific findings indicate the prolongation of post-hospital survival among patients who have undergone complex treatment in intensive care units. At the same time, many of them experienced deterioration of the overall psychophysical condition gained during hospitalization. Many of them relate this disturbing phenomenon to long immobilization during treatment [23].

Within a few hours of immobilization, the process of muscle atrophy begins, which leads to loss of strength and volume of muscle cells by 4–5% weekly during the time of immobilization. This unfavorable process results in weakening of regenerating capacity and reducing the patient’s capability to tolerate physical activity [23–25].

Moreover, patients at intensive care units are often regarded as too ill and under too deep analgesedation to tolerate any kind of activity. Altogether, this causes a “vicious circle of immobilization” which works even after hospitalization [25, 26].

Meanwhile, early inclusion of an individually selected physiotherapy plays a big role in the quality of early and late results of treating patients at intensive

care units. This is a largely safe therapy, improving the current quality of life, significantly reducing hospitalization time, decreasing pain sensations and reducing the risk of complications [27].

Without question, the common aim of doctor, nurse, physiotherapist and psychologist is psychomotor functional improvement of each patient.

Physiotherapy, similarly to psychotherapy, plays a significant role in a therapy directed at improving the functioning of patients treated at intensive care units. Decisions concerning early introduction of physiotherapy in those patients, as well as the selection of techniques and the type of treatment, should be made by an interdisciplinary team of experienced specialists (physicians, nurses, psychologists and physiotherapists) with the involvement of (if possible) a patient and his immediate caregivers.

It is possible exclusively on the basis of output information and subsequently incoming information (in the course of therapy) from the patient himself (continuous monitoring of life parameters, taking into consideration his subjective feelings) and from the team of clinicians managing all the areas of therapy.

Similarly to training athletes, patients at different stages of treatment and rehabilitation need to have an optimal improvement program (improving fitness) developed for them, specifically adapted to them and following their current state of psychophysical capabilities.

Evaluation of physical and mental condition of a patient treated at an intensive care unit is always difficult. Introducing early physiotherapy in those patients requires in-depth knowledge and experience of specialists of various medical fields, i.e. physicians, physiotherapists and psychologists, leading the patient through the time of convalescence. It is important that this cooperation is established as soon as possible and that it is continued throughout the whole period of common clinical activities. For each patient in intensive care, the strategy of building an effective program of early rehabilitation should focus on planning individual convalescence and, if needed, on correcting clinical decisions [28].

### Optimization of development

An increase in motor system injuries among young healthy individuals may currently be observed. Incorrect directing of physical development of a child leads not only to impairment within the biomechanics of the motor system, but also influences the overall harmonious development [29].

Muscular imbalance and asymmetrically distributed compression forces affecting the joints (inseparably linked to gravity) constitute a pathological pattern for the rapidly developing and growing childhood and juvenile skeleton. In such circumstances, in accordance with the Wolff and Delpeche law, bone tis-

sue will grow more on the more stressed side. As a result, in terms of biomechanics, the output condition of the skeletal structure will change into an abnormal one [9, 30].

This mechanism predisposes a young body to developing early complications. A vicious circle is triggered, in which a young individual, by spontaneously performing activity, suffers an injury, which discourages him from physical activity. It is therefore important to consider elements of physiological development in psychomotor optimization. Ancient Greece promoted the cult of a beautiful body on a par with a beautiful mind in order to ensure the harmonious development of an individual. Today, there is still a desire to try to maintain balance (homeostasis) within these two areas of human life, essential to complex treatment of a patient. Such an approach should be an important element of injury prevention and a way to physiological (natural) development of a healthy and happy society.

### Summary

Regardless of the various sources and origins of activities directed at supporting an individual in increasing his functional capabilities, numerous doubts remain. They refer to the way of ensuring safety while performing training tasks, and physiotherapeutic exercises and treatment [30].

Clinical practice indicates that the improvement of an individual's psychophysical functioning encourages multiplying and strengthening positive therapeutic effects. It is scientifically proven that early rehabilitation interventions in the intensive care unit may attenuate or prevent the weakness and physical impairments occurring during critical illness [22–27, 31]. Optimal functioning improvement considering the individual context of each patient should be common objective of the interdisciplinary therapeutic interaction [32].

Systematization of methods for verifying the plan of functional improvement and evaluation of effort incurred in relation to achieved progress of a multidirectional therapy would certainly ensure objectivization of views and refinement of multidisciplinary cooperation. In designing programs supporting the potential of psychophysical functional capability of an individual, it is advised to base them on multidisciplinary chronic pain treatment programs. An example may be a treatment program for chronic back pain. It is based on the assumption that a chronic disease and disability are connected with the following factors which influence each other: biomechanical dysfunction, the accompanying decline in mental health, pain sensations and psychosocial conditions causing stress which arise in this situation [33–35]. Early diagnosis and interdisciplinary therapeutic intervention constitute essential conditions for the effective

treatment of disorders of the musculoskeletal system, and for preventing the development of disability and depressive disorders [36–38]. In the light of the literature concerning health psychology, we can state that optimization of functional improvement of each individual patient should include scientifically documented, thoughtful, multidirectional and interdisciplinary therapeutic activities. We propose to take into account the achievements of Eastern and Western culture in the process of patient functional improvement.

### Conflict of interest

The authors declare no conflict of interest.

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**Address for correspondence:**

**Dorota E. Ortenburger** PhD

The Faculty of Pedagogy

Institute of Physical Education, Tourism and Physiotherapy

Jan Długosz University

ul. Armii Krajowej 13/15, 42-200 Częstochowa, Poland

Phone: +48 604 227 449

E-mail: d.ortenburger@gmail.com