THE BIOMECHANICAL MOVEMENTS FOR THE DISABLED BASED ON ART THERAPY

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Abstract

The purpose of the published work is to open up to new possibilities in the area of treatment processes within rehabilitation, physiotherapy and consequent movement re-education processes for people with disabilities, post-traumatic conditions, or degenerative disease. Art therapy presents a special kind of locomotive biomechanical algorithms focused on creative skills development, emotional development of physically or socially disturbed individuals. Art therapy is used for training and maintenance of motor and sensory functions, as a controlled and targeted activity during which the clients work with the artistic means of expression. The work proposes and describes a methodology, whose purpose is to follow and build on the classic rehabilitation of the physically disabled patient. To compare the effectiveness of the proposed methodology, the observations were made in two patient groups. The control group A and the experimental group B were included in the art therapy of the methodology of the ankle joint movement. After completing the art therapy, the experimental group B showed demonstrably better results in improving their plantar flexion by 8° on average compared to group A. The motivation and subsequent improvement of the patients' agility is the best answer to questions of quality and contribution of using the Methodology of biomechanical movements using art therapy.

Keywords

art therapy, motor and sensory functions, biomechanical movements, artistic means of expression, biomechanical principles, methodology, biomechanics of joints and systems, rehabilitation, physiotherapy, physical disability

Introduction

The biomechanical principles of a healthy individual's momentum form the basis for the work with the physically disabled clients. The doctor, the physiotherapist and the rehabilitation worker treat and help the patient on the basis of their knowledge of anatomy and the biomechanics of the human body. From their experience it is known that the disabled need the psychological support, a strong incentive to handle the rehabilitation and then the integration into everyday life. As a relatively young discipline, the art therapy has good results in the field of psychology and psychiatry. It forms the bridge to the mental balance of the clients and their motivation to live. By combining the biomechanical principles and the art techniques we can form a methodological foundation for the therapy improving the condition of damaged segments of the human body. The cooperation of the physiotherapist and the art therapist has the potential to start a new active form of rehabilitation, suitable for clients with permanent physical damage or a post- traumatic condition. The art therapy and the biomechanics may seem different but these two progressive disciplines united in one unit create the new therapy methodology for the disabled.

Our aim is to highlight the wide use of the biomechanical principles' methodology and its positive

impact on the client, as well as to create a methodological foundation for the therapy aiming to improve the functioning of the damaged segments of the human body by combining the biomechanical principles and the art techniques.

The purpose of the algorithms is to correctly combine the biomechanical movements according to the ideal biomechanical parameterization of the motions of the individual segments of the human body. Through the art therapy techniques, the aim is to find the ideal approach to the client, to gain his interest and subsequently motivate him/her to an independent and active attitude. The active attitude and the positive emotions of the client while applying the methodology have a great importance from both qualitative and quantitative points of view. Art therapy is useful in training and maintaining motor and sensory functions. Art therapy interventions are used for example with people after a stroke in order to exercise the fine and gross motor skills, to restore the memory functions and to maintain the emotional stability [1].

The definition of the art therapy and the forms and techniques used in the methodology of the biomechanical principles

It is important to determine if the client has the skills of artistic expression appropriate to their age and disability. Art therapy is applied as a clinical form of therapy or as a diagnostic method, where it is possible to diagnose the client using the special drawing tests. The drawing enables us to determine the level of intellectual abilities, the extent of motor skills damage, the extent of the psycho-motor abilities, it helps to find the signs of organicity, or visual motor coordination impairments [2].

The most common techniques include a finger-painting, drawing together with the therapist, drawing together with the group, textile forms, working with stone, wall painting and working with clay. With the art therapy we use one or more art techniques, working either on some surface (e.g.: painting with watercolours or tempera paint, collage, or work with paper), or three dimensions (e.g. modelling, pottery, woodwork). Activities include the technique of doodling, freehand drawing or painting, thematic drawing, painting of dreams, fantasies, desires and memories, self-portraits and portraits. The diversity of creative techniques and activities is therefore suitable to raise self-esteem, even with those clients who are not too skilled in drawing and painting.

The classification of the patient and the procedures used

In this research work, the methodology and algorithms for disabled patients are proposed. The most common types of disability that can be helped through art therapy include: cerebral palsy (deficiency of motor control and momentum development caused by brain damage at the time before birth, at birth or within 1 year after the birth), inflammatory brain diseases, epilepsy, mild polio, amputations, myopathy (progressive muscular dystrophy), curvature of the spine disorders, congenital developmental disorders.

The classification of the patients into groups based on their disability and condition was determined according to the verified classification. (3) For the methodology application, a suitable candidate is a patient with his consciousness intact, but with functional, possibly psychological, changes. The program has been designed to indicate pathological manifestations (hemiparesis, quadriparesis, extensive fractures). Based on patient's condition, the healthy limbs are actively exercised and the focus is on the affected/disabled parts that are rehabilitated according to the patients' corresponding diagnosis. Another group is formed by patients with the failing vital functions but with retained consciousness and physical activity (respiratory distress, circulatory failure, etc.). In the beginning, only passive movements are practiced, gradually active movements are increased, and then sitting, standing and walking are practiced [3].

The standard procedures of kinesiology focused on physiotherapist's indicative potential are necessary for building the foundation of the biomechanical principles methodology. Patient or client is at first examined in order to compare the mobility of the joint and the strength of muscle with the healthy limb. According to the observed results, a gradual re-education of the affected part's own function is determined. From the methods of kinesiology, especially the strengthening of the muscle and the limb's re-education are used. All kinds of movements from kinesiology (controlled motion, pendulum, swing and pulling motion) are applied with the methodology using art therapy depending on the client's disability following the professional consultation with a doctor and a physiotherapist. The contraindications must be taken into account, especially with the swing motions with the inflammatory process in the joint. Before initiating therapy, the analysis and synthesis of movements is made and according to the results, the methodological process is adjusted so that the exercise is adequate and does not cause fatigue, or poor coordination due to wrong selection of the methodology.

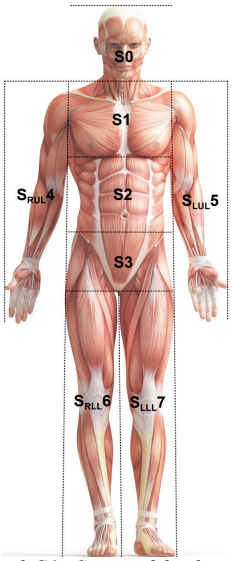
Compensating the disability of one segment by using the muscles of a healthy segment in substitution while performing a particular movement must be avoided at the therapy [4, 5, 6, 7].

The determinants of the methodology for the art therapy treatment

With the treatment using the methodology of biomechanical movements through art therapy, large areas are usually chosen, such as boards, paper pack hanging on the wall or laid out spread on the floor. Soft and fine painting techniques are preferred. The width and intensity of the paint trail indicate the pressure and the stability of the limb. Water-diluted colors are deemed best, from both sanitary and health point of view. They do not contain any volatile chemicals that could harm the health of a client if inhaled. At the end of the activity, they are easily removable from the surface. Paper as a base material is deemed best because of its capacity to absorb water, it's basically a blotting material. The painting dries quickly enough and leaves the informative trail of the limb.

Biomechanical parameterization and graphic scheme

Depicting the layout of the human body sectors with the indication of the standard range of joint movements is used to schematically illustrate the biomechanical parameterization.



S0 - *Sector of the head,* ***S1 -*** *Sector of the thorax,* ***S2 -*** *Sector of the separate organs,* ***S3 -*** *Sector of the pelvis,* ***S4 -*** *Sector of the right upper limb,* ***S5 -*** *Sector of the left upper limb,* ***S6 -*** *Sector of the right lower limb,* ***S7-*** *Sector of the left lower limb,*

Fig. 1: Scheme of the layout of the sectors of the human body.

The methodology of biomechanical movements with the malfunctions of the ankle joint (MBM AJ)

The ankle joint is strengthened by the therapy. The remedial physical education is most often an exercise in the supine or prone position. According to the modern biomechanical studies, the inversion of the foot occurs simultaneously with the plantar flexion, whereas the eversion occurs with the dorsal flexion. Moreover, any movement of the ankle is accompanied with the rotation of the fibula. Our task is to strengthen the inversion and eversion with the simultaneous rotation. The seated position seems to be the most convenient.

Seated position: The classical seated position, as we know it from the previous methods of hip and knee therapy, is unsuitable for the ankle therapy. The client is seated in a positionable chair so that the foot does not touch the floor. At the therapy, the flexion of the hip joint will extend to 90° and more, and it will also enable to alternate the range of flexion and extension of the knee joint. The knee and ankle joints must not be limited by any fixed obstacle anywhere in the range of the intended movement.

The drawing pad, to which the paper is attached, should also be positionable, to be adjusted according to the obtained results of the biomechanical movements. A sponge dipped in paint is fastened onto the foot. The client "paints" vertical lines, alternating the movements of the dorsal and plantar flexion, and exercises the lower foot arch using the motion of inversion and eversion. Similarly, the upper arch. The client creates circles by the circumduction of the ankle joint, and by adding the movements of flexion and extension of the knee joint he is able to extend the picture to the larger area of paper. When the drawing pad is in the position of 90° to the floor, the ankle is for the most of its position in dorsal flexion. When the pad is tilted to 80° and less, the plantar flexion is being strengthened more emphatically.

When using the technique of impression into the clay pad on the floor, the client takes the classic seated position at the 90° flexion at the hip and knee joints. Feet are bare, laid on the floor. By pressing the whole foot into the clay, an imprint is created. Over time, it is significant to observe repeatedly the comparison of the intensity of the healthy and the disabled lower limb's imprint on the individual sessions. The strength of flexors and extensors of the lower limb's toes is reinforced by "scraping" into the clay pad.

The paper presents various methodological procedures in the treatment of disorders of the joints of the upper and lower limbs' joints, in various positions and on the optimal scale. Crucial for the success is the therapist's approach to the client, as well as the client's ability to actively and effectively use the processes of the biomechanical principles and learn the correct biomechanical movement. What is also essential is the

cooperation of the art therapist with the client and that of the art therapist and the physiotherapist, as well as client's individual active work at home and the cooperation of the disabled client's family members.

To compare the effectiveness of the methodology of the biomechanical motion, one example of many analytical measurements in the research group of patients is presented. Patients in the MBMAJ therapy research were divided into two groups, the control group A and the experimental group B. The age of the respondents ranged from 16 to 60 years. In the group A, the average age was 36.73 (min. 17 max. 60) and in the group B the average age was 37.60 (min.16 and max.59), with the prevailing age category from 31 to 45 years. At the time of the research, in the group A there were 7 respondents (46.7 %) diagnosed as an accident, 3 (20 %) respondents with posttraumatic conditions and permanent effects and 5 (33.3 %) respondents who suffered from degenerative disease. In group B there was 1 (6.6 %) respondent with the lower limbs disability, 9 (60 %) respondents diagnosed with trauma (injury), 2 (13.4 %) respondents with posttraumatic conditions and permanent effects and 3 (20 %) respondents who suffered from degenerative disease.

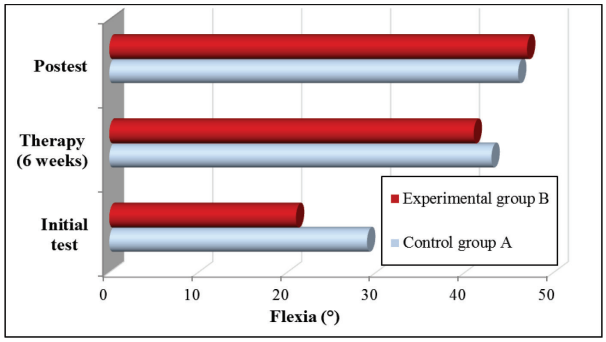


Fig. 2: The comparison of the effectiveness in the group A,B.

Tab. 1: The comparison of the effectiveness of the methodology of the biomechanical motion.

Plantar flexion	Control group A	Experimental group B
Initial test	29°	21°
Therapy (6 weeks)	43°	41°
Posttest	46°	47°

After concluding the MBMAJ therapy, group A can be evaluated as comparable to group B in reaching the maximum extent of the dorsal flexion. The experimental group B was demonstrably better at improving the plantar flexion by 8° more than the comparative group A. The measurements were conducted using the SFTR method (Method of measuring and recording joint motions and positions).

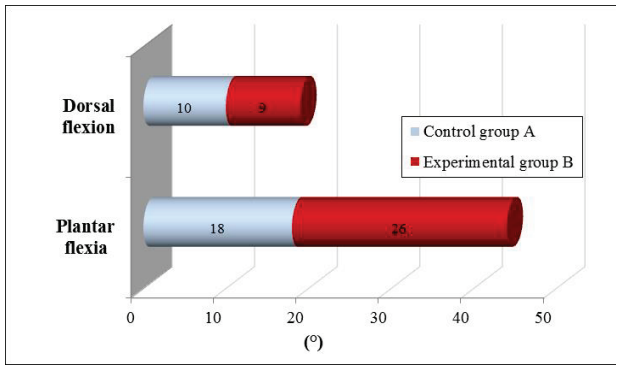


Fig. 3: Dorsal flexion improvement and the plantar flexion improvement A and B.

The termination of the MBMAJ therapy is optional for each participating client. The respondents in both groups answered the question of their motivation themselves by persevering in the process of MBMAJ therapy. In the experimental group A, where the MBMAJ therapy was used, 53 % of the respondents concluded their therapy after six basic weeks, achieving the results of maximum range of motion in the ankle joint. The motivation and subsequent improvement of the clients' agility is the best answer to the questions of the quality and the benefits of the methodology of the biomechanical movements.

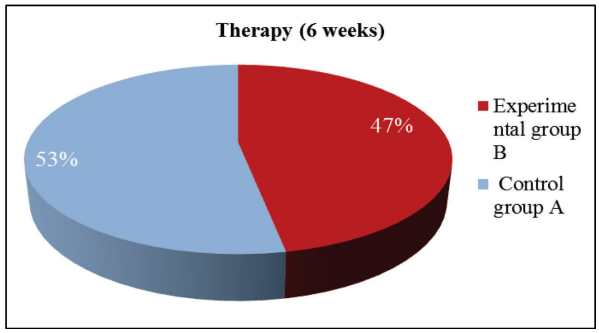


Fig. 4: The therapy termination after 6 weeks in group A and B.

The vision of the project, as it turned out in the course of the realization, proved to be the creation of a single computer program compatible with the interactive board. The methodology development continuation must be supported by its alignment with technology. The rehabilitation centres themselves will benefit from the modernization. The interactive board projection, using the reference trajectory tracking and movement tracing records of the patient's limb could evaluate the time and qualitative practices during the therapy hours more exactly. The recording of the movement and adhering to the reference trajectory, the force of pressure, or even the interruption of the line, spasms or pain and limbs' fatigue, these all form the records kept for every patient. Those records would be

the basis for the analysis of movements by means of measurements and subsequent analysis of the results.

Conclusion

The handicapped have a whole range of creative possibilities as far as their physical and mental condition allow. Art therapy has the potential not only for the rehabilitation of fine motor skills but also for compensation of the mental handicap. To experience success, to encourage one's self-confidence by one's own activities, the sense of creative achievement, it all helps. Art therapy can be applied in various situations and with various diagnoses. The essence of the biomechanical algorithms is to focus on the biomechanical aspects and structures of the human body. The biomechanical perspective and the biomechanical approach are also the focus in several scientific disciplines and professional fields. Biomechanics in collaboration with art therapy has a wide range of possibilities in terms of rehabilitation of the human body, from each individual's active approach. The methodology of the biomechanical motion helps to understand the context of the biomechanical movements and using the art therapy techniques, it helps to implement their proper use.

The proposal of the methodology of the biomechanical movements and its subsequent application in the rehabilitation processes in practice, together with physical therapy, will be an important step in the progress of these disciplines. It will significantly change the current view of the patient as well as the patient's attitude to the therapy of his body.

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