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**ACUTON THERAPY AS AN INNOVATIVE TECHNOLOGY OF
REHABILITATION USING COMBINED MUSICAL-ACOUSTIC AND
MAGNETIC-VACUUM INFLUENCES**

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Abstract. A vital task of modern medicine is the creation of new effective technologies for complex psychosomatic recovery and treatment. This article is devoted to the innovative technology of rehabilitation, stress control and pain treatment, it is called Acutone therapy by the authors, where the achievements of scientific music therapy, Chinese traditional medicine, acoustics and computer technologies were integrated. Technical and methodological features of Acutone therapy and also the examples of effective application in clinical practice are presented in this article.

Keywords: scientific music therapy, acupuncture, acoustics, computer technology, integration, stress, rehabilitation, pain treatment.

АКУТОН-ТЕРАПИЯ

**КАК ИННОВАЦИОННАЯ ТЕХНОЛОГИЯ РЕАБИЛИТАЦИИ
С ИСПОЛЬЗОВАНИЕМ КОМБИНИРОВАННЫХ МУЗЫКАЛЬНО-
АКУСТИЧЕСКИХ И МАГНИТО-ВАКУУМНЫХ ВОЗДЕЙСТВИЙ**

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Аннотация

Актуальной задачей современной медицины является создание новых эффективных технологий комплексного психосоматического оздоровления и лечения. Данная статья посвящена инновационной технологии реабилитации, снятия стресса и лечения боли, названной авторами Акутон-терапией, в которой были объединены достижения научной музыкотерапии, китайской традиционной медицины, акустики и компьютерных технологий. В статье представлены технические и методологические особенности Акутон-терапии, а также примеры эффективного применения в клинической практике.

Ключевые слова: научная музыкотерапия, акупунктура, акустика, компьютерные технологии, интеграция, стресс, реабилитация, лечение боли.

INTRODUCTION

It has been more than 20 years since the 1st international Congress on integrative medicine was held. The scientists from different countries and different specialties such as doctors, biologists, psychologists, philosophers and the representatives of fundamental Sciences got together in Cyprus to discuss the issues of interpenetration of the main directions of medicine and related Sciences and to identify trends in integration processes and strategies for their coordination.

A new concept of interdisciplinary integration was represented there, when the main value is declared to be the psychophysical health of a person as a whole, and not only the medicine of the West and East but also the computer technologies, psychology and art are included in the complex methodological base of the health protection system [1].

The main goal is to create new effective technologies for complex diagnostics, psychosomatic recovery and treatment that they are met modern requirements.

This integrative approach allowed us to create Acutone therapy. It is a high-tech hardware method of rehabilitation, stress control and pain reduction which uses a computerized receptive music therapy in combination with contact acoustic magnetic-vacuum effects on acupuncture points and reflexogenic zones [2].

In such a way, Acutone therapy is based on the achievements of traditional Chinese medicine physics music therapy and modern technologies.

THE VALUE OF TRADITIONAL CHINESE MEDICINE

The traditional Chinese medicine has more than one thousand years of history and includes a wide range of directions such as phytotherapy, massage, various psychophysiological trainings, for example, Wu Shu, qi Gong.

However, the true treasure of Chinese medicine is acupuncture, which as a method of treatment has existed for several thousand years. It includes the influence on biologically active points located on the top of the body for therapeutic purpose.

It is essential that according to ancient teachings, acupuncture points are not located randomly but in a specific sequence on 12 paired "channels" or meridians (Fig. 1).

Each pair of meridians conducts vital energy "Qi" from the periphery of the body to certain internal organs and controls their function.

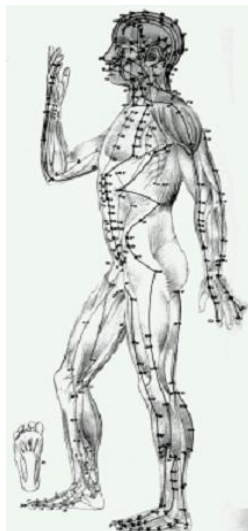


Fig. 1. The Human figure with acupuncture points and meridians

Рис. 1. Фигура человека с акупунктурными точками и меридианами

The basic principles of traditional Chinese medicine are based on two main concepts of ancient Eastern philosophy:

"Yang-Yin" (it means "unity and struggle of opposites" in the modern reading).
"U-sin" or the theory of the five elements. Its essence is to represent the macrocosm consisting of 5 main elements: wood, fire, earth, metal and water. These elements interact continuously with each other.

Currently the acupuncture has got sufficient wide-spread in a number of countries including Russia. What is the mechanism of action of acupuncture from modern positions?

According to some authors the therapeutic effect is based on complex neuro-reflex reactions. The irritation of peripheral nerve endings can generate local segmental and general cerebral reactions.

The importance of hormonal factors is also noted [3].

It was found that acupuncture increases the phagocytic activity of white blood cells and antibody formation providing anti-inflammatory and immunostimulating effects.

It has been experimentally confirmed [4] that acoustic signals affect the electrical conductivity of acupuncture points and change the activity of meridional

(physiological) systems. In this case, the values have frequencies, overtones and exposure time.

Taking into account these features special programs of meridional music therapy have been created.

ABOUT MUSIC THERAPY

Music therapy methods are widely used for rehabilitation of motor and psychosomatic disorders, health practices and personal development.

However, the therapeutic use of music in Europe and in the rest of the world has a long history. Music was successfully used in their practice by Hippocrates, Avicenna and other doctors of antiquity and it was a purely empirical experience and explanations of medicinal qualities of music had a religious and mystical nature.

In the 50s of the 20th century music therapy received state recognition in the United States. In the 60-70s of the XX century music therapy was widely used in England then in Germany and then in other European countries.

Currently the international system of music therapy has formed two main directions: intuitive and empirical, it is special to the Western schools and experimental and evidence-based, it is special to the Russian school of scientific music therapy.

The school of scientific music therapy created by the Russian scientists brought out the world a comprehensive interdisciplinary and natural science approach and also the concept of music therapy as a system of psychosomatic correction.

Scientific facts of music influence and acoustic signals on psychophysiological and cellular processes are established [5].

The own experimental data was got and also the results of domestic and foreign studies were generalized in the form of *the neuro-hormonal resonance theory of acoustic effects* [6].

Music therapy can be divided into three main directions: clinical, rehabilitation and therapeutic [7-10]

Clinical music therapy deals with the treatment of various psychosomatic disorders and the elimination of pathological syndromes.

Rehabilitation music therapy solves the issues of recovering of impaired vital functions after diseases or injuries.

Therapeutic music therapy is used to activate the reserve capabilities of a person

and General recovery.

At the same time, music therapy can be individual or group. Finally, depending on the degree of involvement of the patient in the treatment process, music therapy methods can be classified as passive (receptive) and active; high-tech methods are separately distinguished.

Active methods.

This category includes more than 15 methods where the patient actively uses them, for example, sings or educates to play simple musical instruments and then makes music under the supervision of a specialist. Active methods awaken creative activity, develop personality, communication abilities and self-control skills, improve memory and fine motor skills

Receptive methods.

The receptive type of MT includes more than 20 methods in which the patient passively receives the procedure, for example, listening to a particular program of therapeutic music either live or in the form of an audio recording. Receptive methods are mainly directed to psychological correction, recovery and patient care.

High-tech methods.

The integration of medicine, natural Sciences, art, computer technologies and modern robotics was occurred in the high technologies of scientific music therapy [11].

The development uses an interdisciplinary approach and research results from various fields of science and technology [12-16].

High technologies offer a wide range of possibilities from anti-pain and anti-stress therapy to anti-aging, regenerative music therapy and acoustic biotechnologies. Also the robots with the function of music therapy is developed.

Acutone therapy which is the subject of this article should be considered as high technology.

INDICATIONS FOR USE AND TECHNICAL FEATURES OF ACUTONE THERAPY

Indications for the use of Acutone therapy are: dorsopathy, osteochondrosis; motor disorders; muscle spasms; diseases of the musculoskeletal system; pain syndromes; stress; functional disorders of vital organs and systems.

Contraindications include: oncological diseases; acute infectious diseases; severe vascular sclerosis; thrombophlebitis, varicose veins of the II-III degree; convulsive

States; heart defects, myocardial infarction in the acute period, GB of the III degree, frequent attacks of angina; pustular and fungal skin lesions; the second half of pregnancy; intoxication; acute mental disorders.

The hardware and software complex "Acutone" (Fig. 2) was developed for the implementation of Acutone therapy.

Hardware and software complex "Acutone" includes:

- computer with music therapy software,
- acoustic equipment (multi-channel amplifier, Studio headphones, point-to-point translators),
- a set of acoustic-magnetic-vacuum (AMV) devices of different calibers and also pickup pump.



Fig. 2. Hardware-software complex "ACUTONE»

Рис. 2. Аппаратно-программный комплекс «АКУТОН»

The AMV device includes a massage jar for vacuum therapy with a working unit inside which an acoustic translator is mounted to the fitting pipe and a magnetic rod is attached to it (Fig. 3).

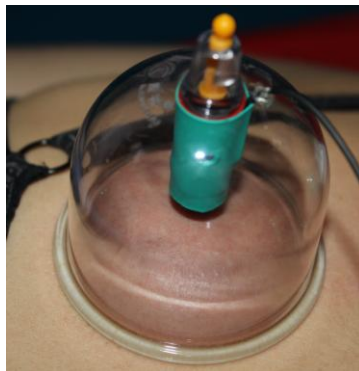


Fig. 3. AMV device

Рис. 3. Устройство АМВ

There are two types of rods, red with a positive magnetic pole and blue with a negative one.

These devices can be used for contact acoustic-magnetic-vacuum (AMV) effects on the trigger zones of the human body and also on acupuncture points and reflex zones.

The procedure of Acutone therapy.

The procedures are performed in a warm ventilated room. The patient should take a comfortable position. A pair of Studio headphones for listening to receptive music therapy programs are put on the hearing organs.

For local acoustic vacuum-magnetic effects, the required number of AMV devices is attached to the reflex zones of the body with the help of a pump (Fig. 4).



Fig. 4. Applications of AMV devices

Рис. 4. Применение устройств AMV

When the installation of headphones and AMV devices is completed an appropriate music therapy program is selected in the computer software and is started broadcasting and the sound is simultaneously delivered to all connected devices.

At the same time there are two main methods of local impacts: zonal and meridional.

The zonal method has its main purpose is the reduction of muscular and joint pain and activation of the recovery processes that involves the application of AMV devices on the reflex and the trigger zone.

AMV devices with blue magnetic rods should be attached to trigger zones with increased turgor and low pain threshold and also to zones located in the projection of inflamed internal organs.

AMV devices with red magnetic rods should be attached to zones with low

turgor and high pain threshold and also to zones corresponding to projections of acupuncture points, general action which are used in traditional Chinese medicine.

The figures diamond-shaped or triquetra is an effective method when in pressure point which is the center of an imaginary figure the device is installed and the other 4 (if it is diamond) or 3 (if it is a triangle) devices are installed on the corners at a distance of 3-5 cm from the central device (Fig. 5). devices

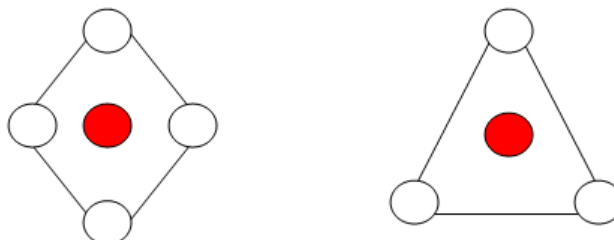


Fig. 5. Scheme of application of AMV devices in the area of trigger zones

Рис. 5. Схема применения устройств АМВ в области триггерных зон

The main purpose of the meridional technique is to perform restorative therapy through musical and acoustic effects on acupuncture points and meridional systems. The functional and software capabilities of Akuton allow us to effectively solve this problem. To get a full-fledged therapeutic effect it is necessary:

- 1) to determine the correct Meridian diagnosis using traditional or instrumental methods;
- 2) to take into account the structural and functional features of music therapy programs and the daily activity of the meridians.

The software Acutone includes 20 digital programs of meridional music therapy which are structurally built on a single principle.

Each program has a name corresponding to the classical meridians of traditional Chinese medicine.

An ordinal number and a sign is followed by the program name: the double signs "- + " or "+ - " indicate a program that is harmonizing (neutral) in nature; the sign " + " indicates restorative and the sign " - " indicates sedative (calming) programs.

After diagnostics of the meridians the impact points are determined. AMV devices are attached to them. After fixing the required number of devices and headphones for the procedure it is easy to select the right program and start its broadcast. To activate the reduced function of the Meridian (physiological system) the programs with the sign "+" or "+ - " are selected, to reduce excessive activity music therapy programs with the sign "-" or "- +" are used. To stabilize the

functional activity of the meridians, harmonizing programs are used.

The best time for direct musical-therapeutic influence on the Meridian (system) is the hours of its maximum activity.

The total duration of Acutone therapy is 15-45 minutes. At the same time, the Acutone devices remain at the installation site about from 10 to 15 minutes for adults, and from 3 to 5 minutes for children until a skin reaction occurs. The exposure time of point translators can reach 30-45 minutes.

THE CLINICAL EFFICACY OF ACUTONE THERAPY

Materials and methods

52 athletes of different sexes at the ages from 23 to 35 years' old who are suffered from moderate back pain (dorsalgia) were examined. By the method of random selection, they were divided into 2 groups: experimental (EG) who received Acutone therapy (25 people) and control (KG) – 27 people who received conventional vacuum therapy.

5 procedures were performed daily with a duration of 15 minutes each. For one procedure we took one or two pairs of corporeal acupuncture points and the most painful points of the back which are identified by palpation on which the developed devices were fixed with the help of the created vacuum and after one of the receptive music-therapeutic programs are started broadcasting.

The effectiveness of treatment was on the 1st and 5th days by examination and psychological testing on a numerical rank scale (Bonica J. J., 1990). Instrumental examination was performed by the method of variational thermoalgometry (VTA) using the RUNO computer diagnostic system and the SI criterion (spectral index).

Attained results.

After the first procedure more than 50% of patients noted a noticeable pain syndrome reduction and overall health improvement. A stress decrease in the pain zones and pain sensitivity decrease during palpation was observed during the examination.

During the study according to the numerical rank scale there was a tendency to a higher efficiency of the combination of musical-acoustic magnetic-vacuum effects in relation to vacuum monotherapy.

This difference reached the level of statistical significance ($p < 0.05$) by the 5th procedure. Significant changes occurred in the EG where the SI value increased from 574 to 750 units ($p \leq 0.05$) which is 30.7%. In KG the SI indicator increased

from 597 to 625 units which was 4.6% ($p \geq 0.05$).

CONCLUSIONS

1. The growth of the SI indicator by 176 units. units ($p \leq 0.05$) in EG indicates that Acutone therapy improves the state of the pain control system and optimizes the activity of physiological systems.

2. Auditory music-therapeutic and local acoustic magnetic-vacuum effects synchronously produced with the help of the APC “Akuton” provide a rapid and persistent regression of pain syndrome and also overall health effect.

At present time there are numerous data got from various clinics about the effective use of Acutone therapy in the treatment of diseases of the musculoskeletal system, psychosomatic disorders, stress and neurosis.

In this regard, Acutone therapy can be recommended for wide use in various medical and health-resort institutions as an effective, easy-to-use and safe technology for rehabilitation and health promotion focused on activating regenerative and recovery processes and increasing the body's reserve capabilities.

ADDITIONAL

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