

result in better outcomes for patients. Systematic MEDLINE search, search of the Cochrane database and of informal sources was performed for the motor rehabilitation of the upper and lower extremity function. For the upper extremity 40 references were identified that evaluate training therapy or neuromuscular electrical stimulation for arm paresis after stroke and describe either a systematic review, meta-analysis, randomized controlled trial or controlled cohort study. The evidence was grouped into three areas of interest: comparison of physiotherapy schools, effects of intensity of training and efficacy of specific arm rehabilitation techniques. The only physiotherapy school with evidence of superior efficacy was the task-oriented “motor relearning program”. Higher intensities of motor rehabilitation can accelerate motor recovery. Various training techniques with demonstrated efficacy were available for specific patient subgroups: arm ability training, constrained induced movement therapy (Taub), repetitive sensorimotor training techniques, robot-assisted training with several different mechanical devices, emg-biofeedback and functional electrical stimulation.

A similar approach was done for the lower extremity and for gait rehabilitation. In addition the EMBASE, PEDro (Physiotherapy Evidence Database) and COMPENDEX (engineering databases) were searched. Treadmill training, and training with electromechanical devices (i.e. “gait trainer”, LOCOMAT) were found to improve walking abilities. Music biofeedback was also shown to restore function. The application of antispastic medication or injection of botulinum toxin as well as orthotic devices were another interesting field of evidence based motor rehabilitation of the lower extremity.

This spectrum of efficient motor strategies available today in rehabilitation will be presented.

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Enhancement of stroke recovery

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THE ROLE OF MUSIC THERAPY IN THE RECOVERY AFTER STROKE

During the past decades a great achievements were done in the field of the stroke therapy, but still the greatest role in the battle against this disease lies on prevention and rehabilitation after the illness occurred. Early start and consistent physical rehabilitation is the absolute need for successful recovery of the patient’s motor skills as well as his/her psychological wellbeing. Many novelties are introduced in the physical therapy methods, among others the role of music is researched more than ever and very significant and optimistic results were established.

In the ancient times great scientists and philosophers explored and noticed the connection between music, human body and health. Pythagoras assumed that harmony of the music influences the harmony of the biological processes in the human body. Several thousands year after, modern technologies enabled almost direct view into the human brain and its functions, among others fMRI studies showed how music activates specific brain areas so today scientists have evidences of influence of music on healthy as well as on damaged brain. These studies have discovered that during listening to the music some areas of motor cortex are activated although the person is completely still. The similar situation occurs while person imagine some tune or rhythm. It is considered that music has complex influence on human brain, motor and sensory areas, what could be an explanation why music is a drive for dancing, singing or expressing of emotions by mimic and gesticulation.

The influence of music on healing processes was investigated by many scientists –medical and musical experts and the clear connection based on clinical studies between music and better recovery after stroke is shown. Particular benefit was shown in muscle and movement control, speech recovery, cognition and mood. Music with its rhythm especially helps recovery of walking, what was presented by researches at Colorado State University who stimulated stroke patients with rhythmic melody and after three weeks they were able to walk more steadily and had better balance than the patients without rhythmic stimulation. Since the area for singing is mostly speared in stroke patients with dysphasia, singing is of the great help in regaining speech abilities. Patients with stroke who have listened to the music during physical therapy had better results than the group without musical background during rehabilitation. Also, they suffered of depression in a less degree and they were emotionally more stable and more communicative than control subjects. Music therapy doesn’t consist only in listening to the music. Playing the instrument uses many aspects of the brain and body, it stimulates and synchronizes motor skills.

The incredible therapeutic power of music is not limited. Further studies should discover more methods of music therapy and more fields where it can be implemented.

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New approaches to stroke rehabilitation – Transcranial Magnetic Stimulations

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Stroke is the most frequent serious neurological disorder world-wide and the third leading cause of death in industrialized countries. It has a high incidence in Europe and is commonly highly disabling.

A neurological deficit after stroke does not reflect only local dysfunction at the site of injury, but is also determined by the distributed impairment of connected neural systems that are structurally intact. This dysfunction may be reflected by diaschisis, deactivation, hyperactivity, in other words intra- and interhemispheric activity imbalance. The distributed impairment principle has been demonstrated for various deficits such as aphasia, spatial neglect, motor dysfunctions etc. It has widespread implications for the fields of neurology, neuropsychology and neurorehabilitation. Understanding of post stroke clinical syndromes in the aspect of anatomical and functional basis should be revised at present and the new knowledge on neural substrates for brain function (especially higher cortical functions) should have an impact on rehabilitation approach.

In over the past last several years, experimental preclinical studies, clinical observations, structural and functional neuroimaging studies, and neurophysiological investigations have provided greater insight into the basic mechanisms underlying neuroplasticity and recovery after stroke. Different techniques became available for the noninvasive evaluation of functional activity in the human brain and allowed to investigators to formulate questions geared to understand the mechanism underlying the ability of the human brain to reorganize and to design rehabilitation programs.

One of these techniques is Transcranial Magnetic Stimulation (TMS) developed by Barker in 1985. Consequently, it has become possible to stimulate specific cortical regions in a relatively focal manner. In 1987, repetitive TMS (rTMS) was introduced (regularly repeated TMS delivered to a single scalp position). Repetitive TMS appears to have an effect on cortical excitability that lasts beyond the duration of the rTMS applications itself. Findings to date suggest that the modulatory effects of rTMS on cortical excitability may be inhibitory or facilitatory depending on the frequency, intensity, duration and intertrain interval. A growing number of studies utilize these modulatory effects of rTMS on cortical excitability as a potential therapeutic technique in many neurological and psychiatric disorders. Discovery of this therapeutic effect of rTMS can be used to design a more rational and better focused rehabilitation treatment after stroke, for example, as a complementary treatment in speech-language therapies in aphasia or in other impaired motor and cognitive functions (Brighina et al., 2003, Murase et al., 2004, Neiser, Martin et al., 2004, 2005).