Neural Reorganization Underlies Improvement in Stroke-induced Motor Dysfunction by Music-supported Therapy

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Motor impairments are common after stroke, but efficacious therapies for these dysfunctions are scarce. By extending an earlier study on the effects of music-supported therapy, behavioral indices of motor function as well as electrophysiological measures were obtained before and after a series of therapy sessions to assess whether this new treatment leads to neural reorganization and motor recovery in patients after stroke. The study group comprised 32 stroke patients in a large rehabilitation hospital; they had moderately impaired motor function and no previous musical experience. Over a period of 3 weeks, these patients received 15 sessions of music-supported therapy using a manualized step-by-step approach. For comparison 30 additional patients received standard rehabilitation procedures. Fine as well as gross motor skills were trained by using either a MIDI-piano or electronic drum pads programmed to emit piano tones. Motor functions were assessed by an extensive test battery. In addition, we studied event-related desynchronization/synchronization and coherences from all 62 patients performing self-paced movements of the index finger (MIDI-piano) and of the whole arm (drum pads). Results showed that music-supported therapy yielded significant improvement in fine as well as gross motor skills with respect to speed, precision, and smoothness of movements. Neurophysiological data showed a more pronounced event-related desynchronization before movement onset and a more pronounced coherence in the music-supported therapy group in the post-training assessment, whereas almost no differences were observed in the control group. Thus we see that music-supported therapy leads to marked improvements of motor function after stroke and that these are accompanied by electrophysiological changes indicative of a better cortical connectivity and improved activation of the motor cortex.

Key words: neurorehabilitation; plasticity; event-related desynchronization and coherence; stroke; music-supported therapy

The effectiveness of standard physiotherapeutic approaches in stroke rehabilitation has been found to be quite limited, thus calling for innovative motor rehabilitation approaches.1–4 Data have accumulated indicating that repetitive massed practice of movements leads to improvement in motor function,4–8 with changes being attributed to neural reorganization.9–11 A different line of studies has shown rapid plastic adaptation due to music performance, which is not restricted to cortical motor areas but also involves auditory and integrative auditory–sensorimotor circuits.12–15 This suggests that music-making, even in unskilled patients, might be an effective means to induce plastic changes in the motor system.


