Breaking the Silence: Brain-Computer-Interfaces in Paralysis

Brain-Computer Interfaces (BCI) using neuro electric activity from the brain provides signals for external devices such as computers, wheel chairs, and prostheses. Here invasive and non-invasive BCIs using slow cortical brain potentials, mu (SMR) rhythm and high frequency gamma oscillations are presented. The "Thought Translation Device" trains completely paralyzed patients with Amyotrophic Lateral Sclerosis (ALS) to regulate their slow cortical potentials (SCP) with neurofeedback. After achieving 75% control patients can select letters or words. Locked-in patients continue to communicate with this system.

Data on quality of life and ethical considerations on doctor assisted suicide are discussed. An invasive system using subdural implantation of macroelectrodes and Support Vector Machine- ECoG-Classification allows verbal communication with brain activity in very short time periods. A new system for rehabilitation in chronic stroke connects an artificial hand affixed to the paralyzed hand with the lesioned motor area: patients move the paralyzed hand with motor imagery and changes in SMR-rhythm.