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Paper Title: Linear Relationship between Corticomusclar Coherence and Upper Limb Voluntary Contraction

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Abstract

Stroke is a disease with a high mortality rate and is one of the leading causes of acquired disability in adults. Some patients experience some forms of disability after a stroke, such as long-lasting physical paralysis, speech impairment, and cognitive impairment. For post-stroke hemiplegia, studies have demonstrated that long-term and continuous resistance training can help patients regain some degree of motor ability. However, the fact is that some patients have not regained motor function after 3-6 months of rehabilitation training. The reasons for this are that it is difficult for patients to adhere to the training and to obtain appropriate training guidance.

To address the problem of inadequate resource reserves for rehabilitation physicians, robotic systems were introduced into post-stroke rehabilitation training from the 1990s. However, in actual use, the motor assistance that robotic systems can provide is still judged by rehabilitation physicians based on the patient's status and degree of muscle damage, and the patient's motor initiative and attentional state cannot be fully explored.

In this study, a hybrid brain-computer interface-based post-stroke rehabilitation training system was designed to infer patients' muscle rehabilitation status based on the level of corticomuscular coherence (CMC), so as to provide adaptive training guidance to patients during the long-term and continuous training process, promote patient initiative during the training process, and enhance the training effect. This study focuses on the correlation between corticomuscular coherence and voluntary muscle contraction, so as to infer the muscle contraction status of patients based on corticomuscular coherence. Finally the present study obtained a significant positive linear relationship between corticomuscular coherence and different force magnitudes in the alpha band.