The Electromyographic Evaluation of the Bilateral Muscle Asymmetry of the Latissimus Dorsi in Martial Arts and the Effect of Real-Time Biofeedback on Technique Improvement

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Martial arts performance assessment of karate practitioners was conducted using a low-cost electromyography (EMG) sensor and data acquisition system. The participants were asked to perform karate techniques that simulated the end of the explosive punch (instant contract and release of muscles, “Kime”). The EMG signals of contraction and relaxation of the latissimus dorsi muscle were recorded and analyzed at 5-millisecond resolution. During the assessment, the participant performed the kime technique on the dominant side first without EMG biofeedback, followed by the technique performance and evaluation with real-time EMG biofeedback. The assessment sequence was repeated on the nondominant side. The research results supported the hypothesis as there were significant differences between the strengths, and contraction and release rates of dominant and nondominant latissimus dorsi muscle. In addition, the participants experienced remarkable improvements in their techniques using EMG-based muscle analysis and real-time EGM biofeedback. However, the degree of improvement varied among the participants. The research illustrated the importance of the EMG methodology and field test results, which would help reveal an in-depth understanding of the difference of the nondominant and dominant side of certain muscles in sports/martial arts setting, effective training methods to improve overall performance, and reducing muscle imbalance and injury, by utilizing the EMG system.

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