

## **Recent observations in surface electromyography recording of triceps brachii muscle in patients and athletes**

### **Abstract**

**OBJECTIVE:** To observe and analyse the literature on the use of surface electromyography electrodes, including the shape, size, and metal composition of the electrodes used, the interelectrode distance, and the anatomical locations on the muscle at which the electrodes are placed, for the observation of the triceps brachii muscle activity in patients and athletes.

**METHODS:** We searched the ScienceDirect and SpringerLink online databases for articles published in the English language during the last six years (between January 2008 and December 2013). We specifically searched for the keywords “EMG” and “triceps brachii” in the full text of each of the articles. The inclusion criteria were articles on the use of surface electromyography electrodes to observe the activity of the triceps brachii muscle in patients and athletes.

**RESULTS:** In the 23 selected articles, the activities of the triceps brachii muscle in a total of 402 subjects were measured using surface electromyography electrodes: 262 subjects in the studies that focused on the rehabilitation of patients with various disorders, and 140 subjects in the studies that focused on the sports performance of various athletes. To record the surface electromyography activity of the triceps brachii muscle, the electrodes were placed over the muscle belly or the three heads (lateral, long, and medial) of the triceps brachii muscle with diverse interelectrode distances. Seventeen studies used bipolar or triode silver/silver chloride electrodes, one study utilised bipolar gold electrodes, one study applied bipolar polycarbonate electrodes, one study used a linear array of four silver bar electrodes, one study utilised DELSYS parallel bar nickel silver electrodes, and two studies did not clearly mention the composition of the electrodes used.

**CONCLUSIONS:** Bipolar silver/silver chloride circular-shaped electrodes are utilised more frequently than electrodes with a different metal composition and shape. The anatomical locations of the triceps brachii muscle that mainly considered for electrode placement are the lateral, long, and medial heads. A 10-mm electrode size is commonly used to measure the sEMG activity more efficiently. However, we found that an electrode size of up to 40 mm may be used to reliably measure the sEMG activity on the triceps brachii muscle. A 20-mm interelectrode distance is commonly used to measure the sEMG activity using the above mentioned muscle locations and silver/silver chloride electrodes. We also identified others factors that should be taken into account for the use of the sEMG recording technique on the triceps brachii under real-time conditions.

### **Keywords**

Surface electromyography electrodes; Triceps brachii muscle activity; Rehabilitation; Sports