

## 53. ELECTROMYOGRAPHY IN SWIMMING PERFORMANCE: A REVIEW

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### Introduction

A large quantity of investigation produced over several decades has been conducted to better understand the electromyography (EMG) in sport, specifically in swimming. EMG is one of the topics more attractive and growing within the science of swimming, due to the challenge to make data acquisition in aquatic environment. The main objectives of this study were to review: a) the contribution of EMG to overall swimming performance, b) the effects of the four swimming techniques in EMG and c) the application of EMG in swimming starts and turns.

### Methods

B-On, PubMed, Scopus, Google Scholar, ISI Web of Science, the proceedings of international congresses on biomechanics and swimming databases were also searched from 1961 to September 2014, using the combined keywords “swimming”, “swimmer”, “electromyography” (EMG). The inclusion criteria were: (1) containing EMG data on competitive swimming; (2) amateurs and/or elite swimmers of all ages, all swimming techniques; swimming starts and turns; and (3) the articles written in English and Portuguese. The exclusion criteria were: (1) papers with no EMG data; (2) publications in languages other than those used in the inclusion criteria.

### Results

From 36 studies found, a high variety of EMG methodologies were reported. With respect of the four swimming techniques, the front crawl is the most studied with 23 studies published, follow by breaststroke 7 studies, and butterfly and backstroke tied with 2 studies. Lastly, the starts with 1 and turns with 3 studies reported. The results showed similarities in the selection of the main muscles for each swimming technique, verifying that the muscles of upper limbs were the most studied. The signal processing undergoes a trend towards the use of spectral analyses instead of temporal/qualitative analyses.

### Conclusion

This review came to the conclusion that EMG in swimming can provide valid measurements in the domain of data acquisition approaches and signal processing, therefore, researchers should explore more the potential of this technique in starts and turns, towards to describe the muscle activation patterns and to evaluate timing parameters to characterize neuromuscular patterns responsible for an efficient movement.

### References

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