



Electromyographic Analysis of Quadriceps Muscle among Children with Cerebral Palsy Underwater and on Dry Ground

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Introduction

Children with cerebral palsy (CP) show some gait patterns that can be attributed to the reduced muscular activation and strength.

We can analyse the muscular activation through Electromyography (EMG) and the recordings of the human movements underwater and on dry ground are the subject of many studies among adults.

However, there are a few researches about this kind of analysis on children with neurological disorders.

Purpose

The aim of this study was to verify the muscular activation of quadriceps muscle among children with cerebral palsy while doing different activities underwater and on dry ground.

Participants

The research was carried out on a group of nine children with spastic diparesis cerebral palsy classified on a GMFCS level II and a control group of eleven healthy children.

Methods

We compared the EMG activity of the rectus femoris during three different activities in water with immersion to the xiphoid bone and on dry ground.

The asked activities were: the maximum voluntary isometric contraction (MVIC), standing up from a chair and walking.

Methods

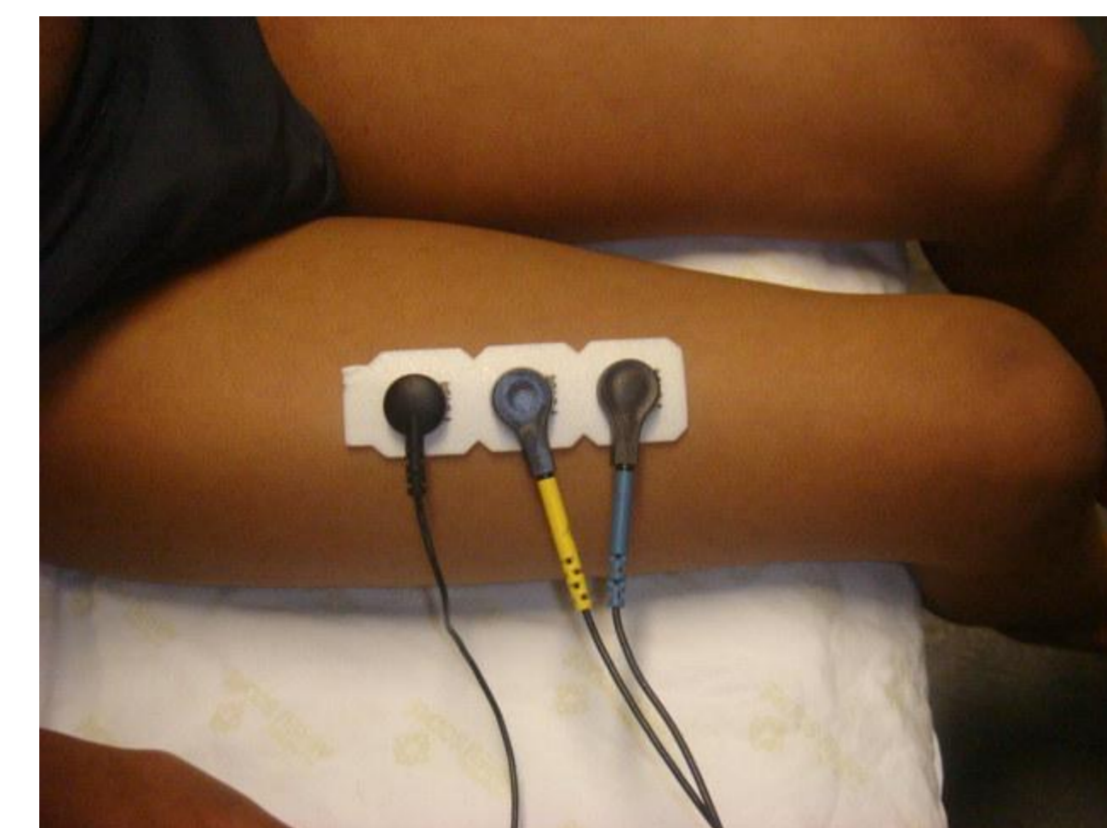


Figure 1 – Electrodes position



Figure 2 – MVIC underwater

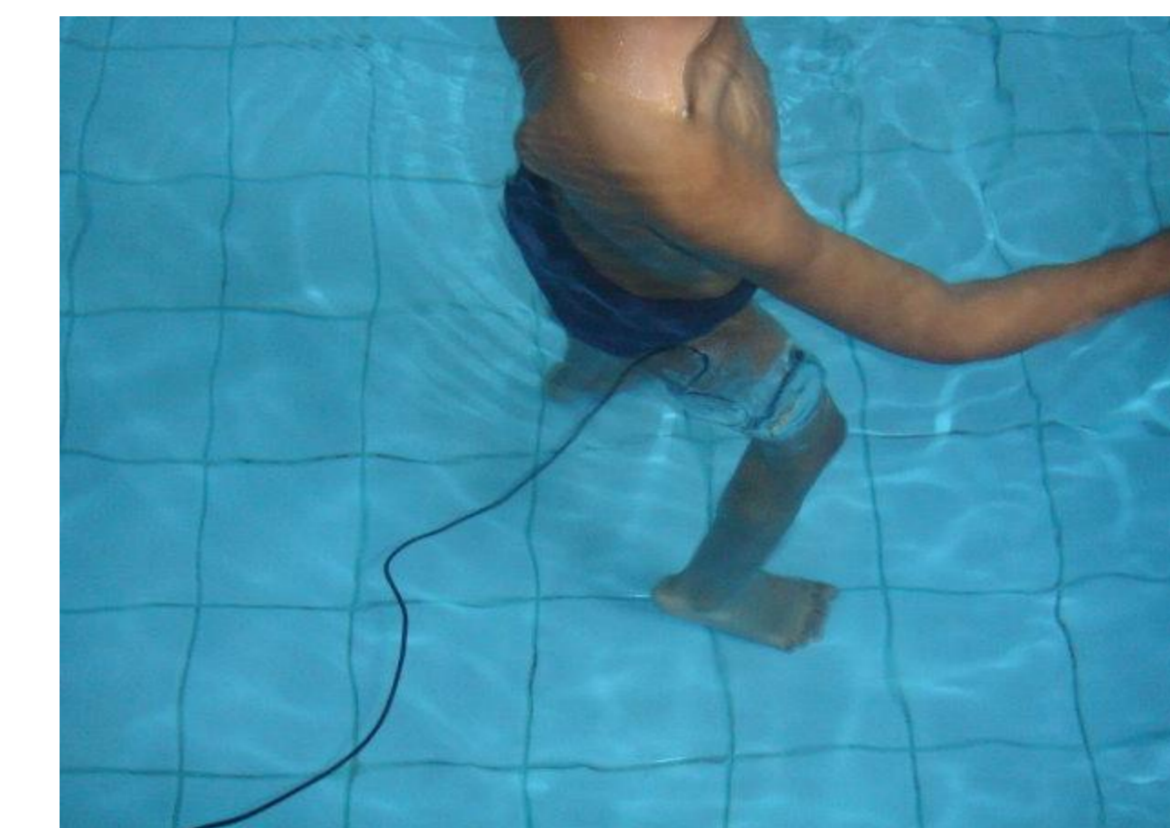


Figure 3 – Walking underwater

Results

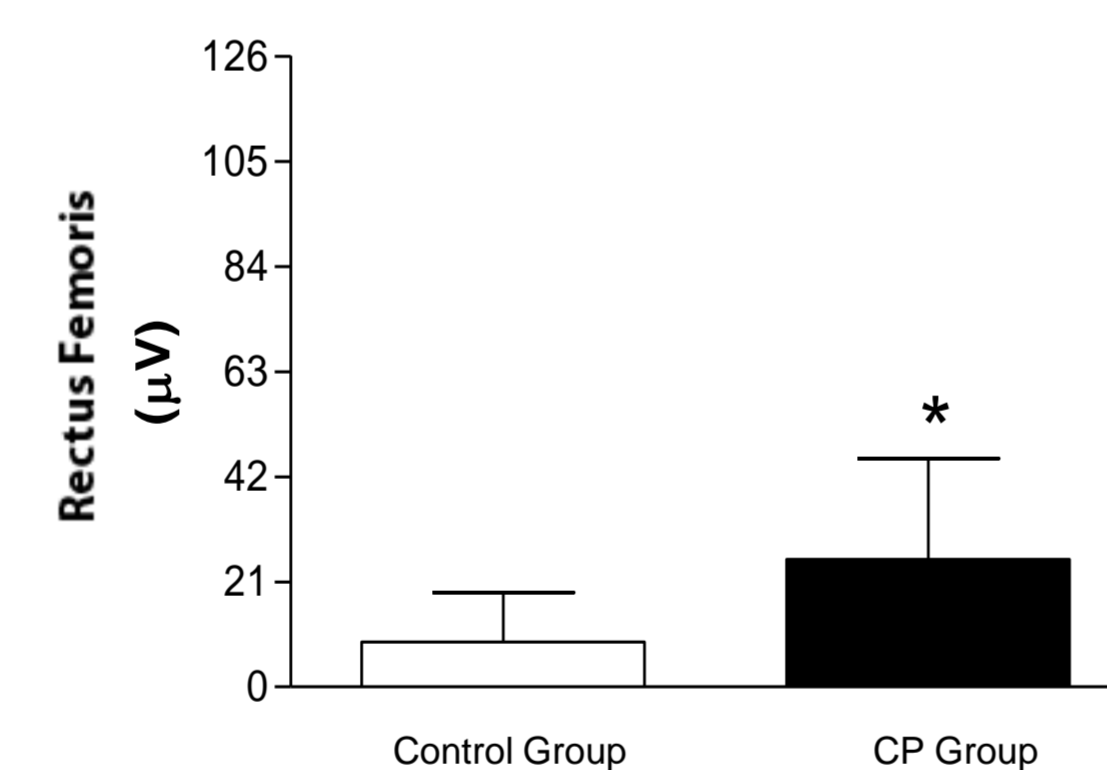


Figure 4 – Comparison between both groups while standing up underwater (p=0,0039).

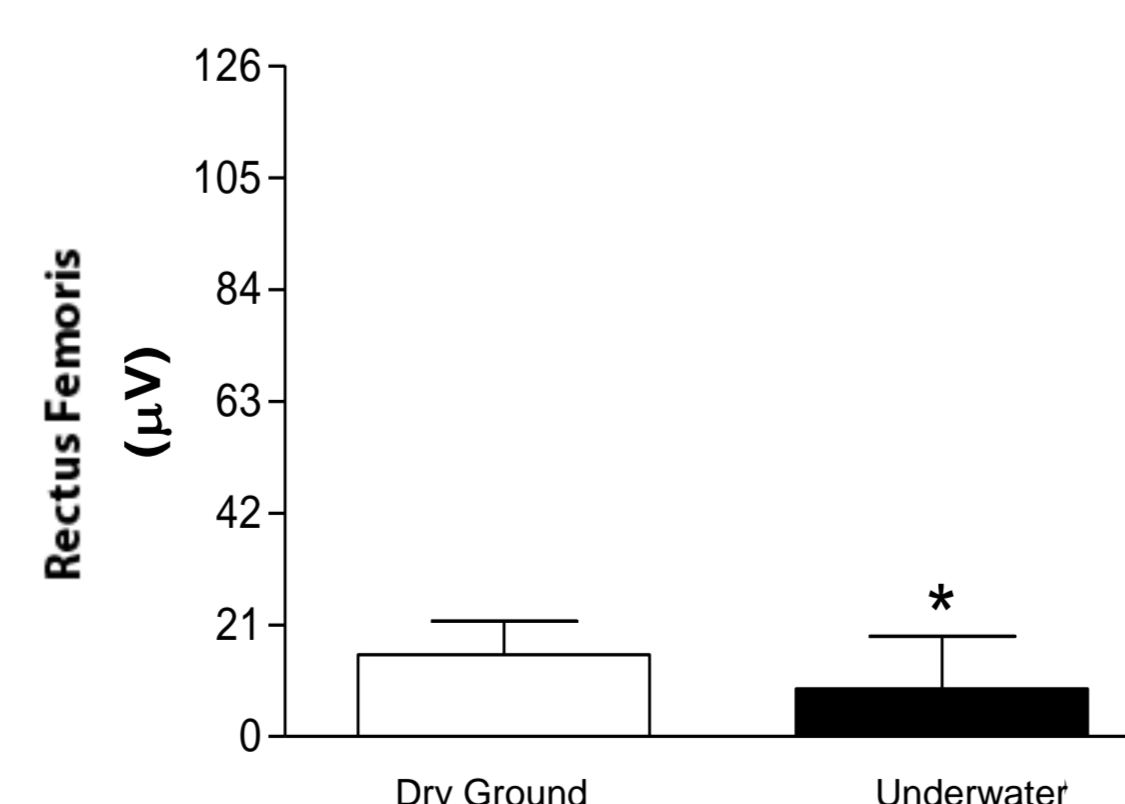


Figure 5 – Control group comparison during standing up underwater and on dry ground (p=0,0137).

Results

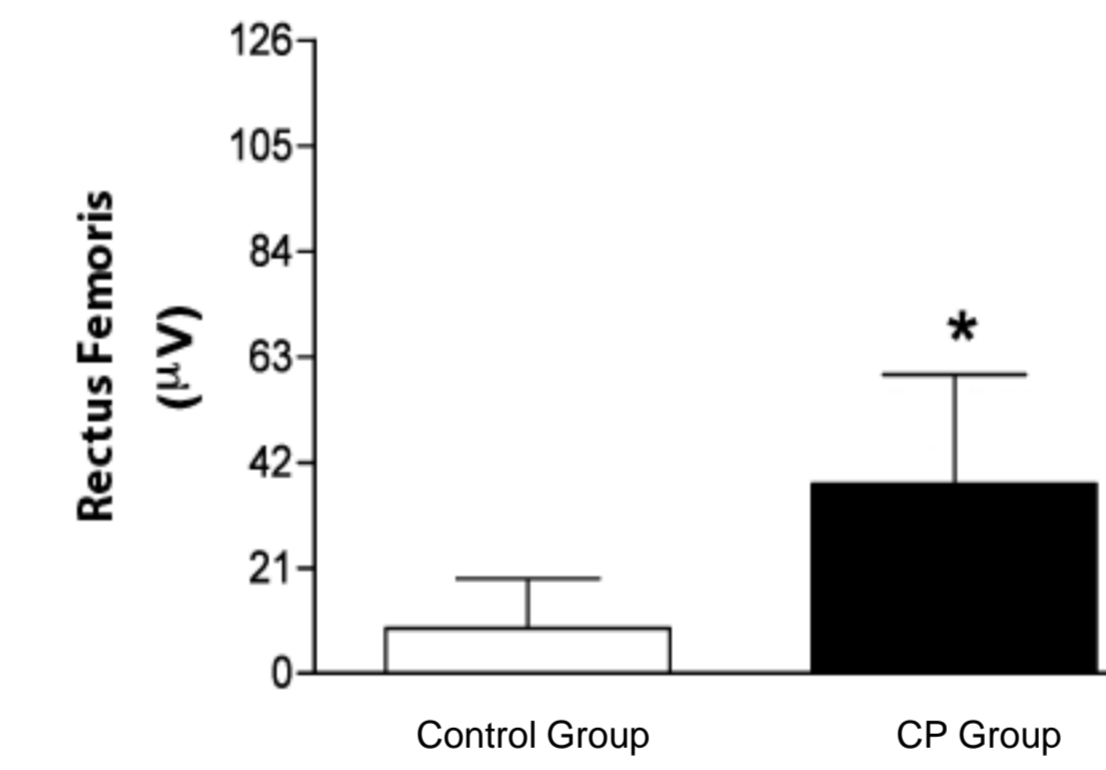


Figure 6 – Comparison between both groups while walking on dry ground (p=0,0014).

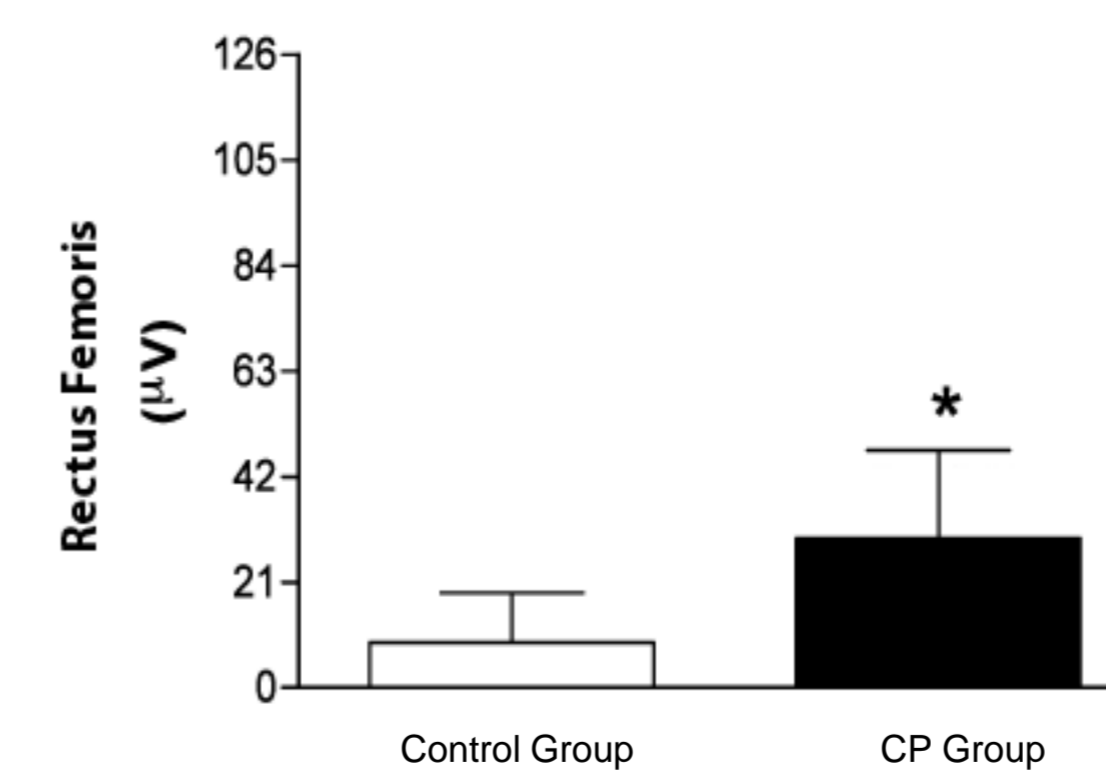


Figure 7 – Comparison between both groups while walking underwater (p=0,0007).

Discussion & Conclusions

We found that, while walking underwater and on dry ground, there was higher activation of rectus femoris in the group of children with CP than in the control group.

We hypothesized that this occurred because of the gait pattern most common on the children with spastic diparesis, which is the crouch gait. On that pattern, there is an increased flexion of the knee during the stance phase of the gait and the quadriceps muscle works excessively as a result, trying to extend the knee.

Regarding standing up activity, in the control group there was a lower activity of rectus femoris underwater when compared to dry ground, which can be justified by the aid of the buoyancy.

References

- Rosenbaum P et al. A report: the definition and classification of cerebral palsy. Dev. Med. Child. Neurol. Cambridge University Press; 2007.
- Damiano DL et al. Relationship of spasticity to knee angular velocity and motion during gait in cerebral palsy. Gait and Posture 2006; 23; 1-8.
- Quach JH. Surface electromyography: use, design and technological overview. Montréal: Concordia University 2007.
- Temelli Y, Akalan NE. Treatment approaches to flexion contractures of the knee. Acta Orthopaedica et Traumatologica Turcica 2009 43(2): 113-120.

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