

Motor Adaptations During Stair Ascent and Descent in Individuals with Chronic Primary Low Back Pain

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Summary

Chronic primary low back pain (CLBP) negatively impacts daily activities and quality of life. This study investigates motor adaptations during complex daily tasks using high-density electromyography (HD-EMG) in individuals with and without CLBP. All participants performed stair ascent and descent tasks, during which individuals with CLBP exhibited alterations of motor adaptations.

Introduction

Low back pain is the leading cause of disability worldwide. While it is well known that individuals with CLBP exhibit altered motor control, most studies have assessed these alterations using controlled, simple or low-energy-cost tasks, such as isometric contractions or walking.^[1-2] However, these tasks may not fully capture the motor adaptations required for more complex movements. This study investigates muscle activation during the ascending and descending of four stairs in individuals with CLBP compared to a control group.

Methods

Twenty participants, 10 with CLBP and 10 without CLBP, performed 20 trials of ascending and descending four steps staircase. They used their dominant leg for both ascent and descent at a self-selected pace. Muscle activity of the left and right erector spinae was recorded using two HD-EMG grids of 64 channels. Covering L1 to L5. An instrumented staircase with two force plates, and passive kinematic markers were used to control movement strategies. Muscle activity amplitude of the erector spinae was computed using the root mean square (RMS), Sub-phases of the ascending and descending tasks were analyzed. For each leg, swing and stance phases were examined separately. The RMS means of 20 repetitions for ascent and descent tasks was used for statistical analysis. A t-test compared RMS between groups for each phase.

Results and Discussion

No significant between-group difference regarding age, sex, body mass, height, and BMI. EMG RMS values were significantly higher in the CLBP, except during the stance phase using the non-dominant leg in both ascent and descent tasks. (Figure 1).

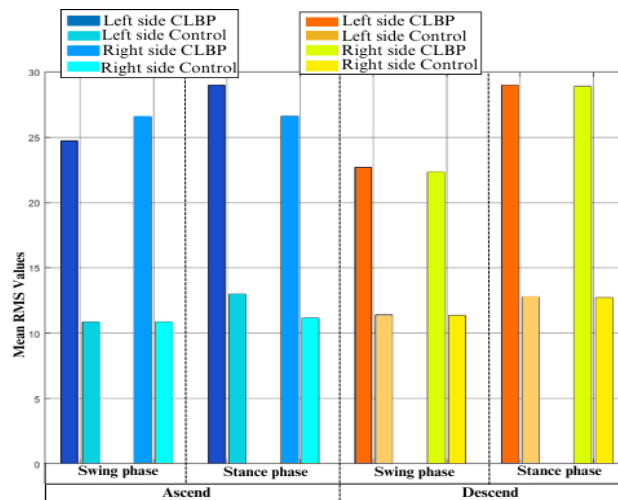


Figure 1: Comparison of RMS between CLBP and control groups during ascent/ descent

Previous research has shown that individuals with CLBP exhibit an increase in muscle activity amplitude, but these studies have primarily focused on simple isometric or low-energy-cost tasks.^[1] This study explores more functional and demanding tasks, offering novel insights into the motor control strategies employed by individuals with CLBP.

Conclusions

Greater erector spinae activity in individuals with CLBP during stair ascent and descent suggests altered motor control during complex tasks. This work builds on previous research, which has largely examined simpler or low-energy tasks. Future studies should examine the spatial redistribution of muscle activity, which will allow to expand our understanding of motor adaptations during complex tasks.

Acknowledgments

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References

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