

# Impact of lower limb exercises on musculo-mechanical properties of the lumbar erector spinae.

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**BACKGROUND** Recent histological research indicates that fascia is able to modify its tensional state. This might be of particular relevance for the locomotor system as the skeletal muscles are morphologically linked by connective tissue [1]. A strain transmission along myofascial chains might explain pain radiating to remote structures and treatment effects in adjacent muscles. However, while there is solid evidence from experimental dissection studies, the in-vivo behavior of fascia concerning intermuscular force transmission is poorly understood. The present randomized, cross-over trial therefore aimed to elucidate the impact of lower limb exercises on musculo-mechanical properties of the neighboring lumbar erector spinae and hypothesizes that strain can be transmitted from the lower extremity to the trunk.

**METHODS** The superficial back line (consisting of plantar fascia, gastrocnemius, hamstrings and erector spinae [2]) was chosen to test the hypothesis. A total of 13 asymptomatic subjects (7 females, 25.5±6 yrs) completed three interventions in a randomized order: (1) stretching of the gastrocnemius and the hamstrings, (2) activation exercises of the gastrocnemius and the hamstrings at 20% of the individual maximum strength (with EMG-controlled inactivity of the lumbar erector spinae), (3) inactive, seated control condition. The interventions were separated by a wash-out period of one week. Prior and post treatments, elasticity and stiffness of the lumbar erector spinae were measured by means of myotonometry. Friedman tests and post hoc pairwise Wilcoxon tests were computed to detect differences between conditions.

**RESULTS** Data analysis revealed systematic differences between the disposed treatments ( $p < .05$ ). After stretching, elasticity (+1.7%) was significantly higher compared to control (-4.8%;  $p < 0.05$ ). Activation exercises reduced elasticity (-6.3%), but not significant in relation to the control group ( $p > 0.05$ ). Regardless of the condition, stiffness remained unchanged ( $p > 0.05$ ).

**CONCLUSION** The findings of our research yield in-vivo indications for a slight impact of stretching exercises on the elasticity of the lumbar erector spinae. Further research should include a larger sample size and additional follow-up measurements in order further delineate the magnitude of strain transmission along myofascial chains.

## REFERENCES

- [1] Wilke J, Krause F, Vogt L, Banzer W. What is evidence-based about myofascial chains? A systematic review. DGSP; 2014
- [2] Myers TW. Anatomy trains: Myofascial meridians for manual and movement therapists. Third edition: Churchill Livingstone; 2013