

Publication

The effect of different running shoes on treadmill running mechanics and muscle activity assessed using statistical parametric mapping (SPM)

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Author(s) Nüesch, Corina; Roos, Elena; Egloff, Christian; Pagenstert, Geert; Mündermann, Annegret

Author(s) at UniBasel [Egloff, Christian](#) ; [Nüesch, Corina](#) ; [Mündermann, Annegret](#) ; [Pagenstert, Geert](#) ;

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Differences in joint mechanics between running shoes are commonly assessed using discrete parameters, yet statistically significant differences in these parameters between shoes are often scarce with small effect sizes. Statistical parametric mapping (SPM) has been suggested as suitable method for analyzing one-dimensional data such as kinematic, kinetic or muscle intensity time series.; The purpose of this study was to determine differences in treadmill running mechanics between novel running shoes using SPM.; Joint kinematics, muscle activity and ground reaction force were assessed in 19 rearfoot runners in their own shoes and in two test shoes during treadmill running (test shoe 1: 13 distinct rubber elements in the outer sole, springboard within EVA midsole with posterior elements shifted anteriorly by approximately 1.5; test shoe 2: 17 distinct EVA elements with conventional heel geometry). Joint kinematics were measured using an inertial sensor system, and ground reaction force was measured using an instrumented treadmill.; SPM analysis with repeated measures ANOVA revealed significant reductions in the ankle angle and in tibialis anterior, peroneus longus, vastus medialis and lateralis muscle activity during weight acceptance and in peroneus longus muscle activity during early and late swing and in semitendinosus muscle activity during late swing for the test shoes. Significant differences in muscle activity were observed in the interval of the main activity of the respective muscle. SPM on individual data revealed statistically significant and relevant within-subject differences between conditions in kinematic, muscle activity and ground reaction force patterns.; Inertial sensor systems and SPM may provide an efficient way of detecting changes in joint mechanics between running shoes within runners. Detecting within-subject differences in running mechanics between conditions not only requires statistical criteria but also criteria on the relevance of the magnitude of differences.

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