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# Experimental investigation of a novel class of self-centring spinal rocking column

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## Abstract

This paper explores a proof of concept self-centring spinal column concept experimentally. The idea of the system is inspired by the mechanical interaction of the vertebral bones and intervertebral discs in human spine. Experimental tests are undertaken to explore whether a similar bridge pier system could be constructed to withstand seismic dynamic loading in an equally efficient manner. The experimentation is performed on tied (pre-tensioned) wooden blocks (vertebrae) with and without rubber strips between the vertebrae acting as the intervertebral discs. Small-scale test specimens are excited sinusoidally using a small-scale shake table, and the response of the system recorded through triaxial accelerometers attached to the structure. The nonlinear dynamic response and mechanics of the system are then investigated under sinusoidal dynamic excitation. It is found that the integration of intervertebral rubber discs into wooden vertebrae reduces the nonlinearity of the system, and increases the flexibility and damping. The experimental results show that the proposed system can sustain large lateral displacement without any residual deformation after the excitation.

**Keywords:** Rocking column, Accelerated bridge construction, Vertebral bridge pier, Backbone curve, Nonlinear dynamics, Frequency Response Function

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