ALTERATIONS IN THE NEURAL PROCESSING OF PROPRIOCEPTION IN PATIENTS WITH NON-SPECIFIC LOW BACK PAIN COMPARED TO PAIN-FREE INDIVIDUALS

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Introduction
Patients with non-specific low back pain (NSLBP) exhibit a reduced ability to weigh back proprioception relative to ankle proprioception during standing. However, it remains unclear whether this reduced ability for proprioceptive weighing in NSLBP stems from an altered neural processing of proprioception.

Purpose
To study (a) whether patients with NSLBP show an altered neural processing of ankle and back proprioception compared to controls, and (b) whether differences in proprioception-related brain activity correlate to an impaired ability for proprioceptive weighing during standing.

Materials and Methods
Proprioceptive weighing during standing was evaluated by measuring center-of-pressure displacements during muscle vibration (60Hz) during standing in 20 patients with NSLBP and 20 matched controls. Brain activity during proprioceptive processing was determined by applying muscle vibration at the ankle and lower back muscles during functional magnetic resonance imaging. Group differences in proprioception-related brain activity, and correlations with proprioceptive weighing during postural control, were investigated.

Results
Patients with NSLBP exhibited an increased activation of the right inferior frontal gyrus (IFG) and primary motor cortex (M1) during ankle proprioceptive stimulation, and the right amygdala and left superior frontal gyrus during back proprioceptive stimulation. Activation in the right IFG during ankle proprioceptive processing correlated with a better proprioceptive weighing ability during standing in the NSLBP group.

Relevance
The results highlight that NSLBP may not be driven solely by structural alterations in the musculoskeletal system.

Conclusion
Over-activation of lower- and higher-order sensory processing areas (M1, IFG) during ankle proprioceptive stimulation might indicate a compensation strategy to maintain optimal postural control in NSLBP. Additionally, over-activation of the amygdala and frontal cortex during the stimulation of back proprioception may indicate an increased threat detection and hypervigilance towards sensory stimuli applied at the painful body part in NSLBP.

Implications
The diagnosis and treatment of NSLBP should include strategies that address brain changes.