Impact of Altered Plantar Cutaneous Inputs on Postural Control in those with Chronic Ankle Instability

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Introduction:

Approximately 30% of lateral ankle sprains result in chronic ankle instability (CAI), or repetitive bouts of instability resulting in reinjury. Impaired neural control may precipitate CAI or be a consequence of repetitive instability. When cutaneous plantar receptors are injured, the central nervous system compensates by placing a new “weight” on information coming from the region. Sensory reweighting may be an important component to rehabilitation in patients with CAI.

Methods:

Five adults with CAI (age:22.40±3.36 years; height:177.29±8.50 cm; mass:82.00±17.15 kg) performed unilateral (involved limb) balance testing under eyes-open and eyes-closed conditions while standing on variable surfaces on a force plate. Variables included a hard texture, a soft texture, sensory deprivation through ice, and control (force plate). Individuals performed 3 trials per variable/condition. Time-to-boundary (TTB) postural control outcomes were compared across conditions via repeated measures ANOVAs separately for eyes-open and eyes-closed. Alpha level was <0.10.

Results:

TTB was not different across surfaces with eyes-open. TTB was negatively affected under eyes-closed using a hard texture (P=0.095) and sensory deprivation through the ice (P=0.063).

Conclusion:

Manipulating the foot-surface interaction via cooling or the hard texture negatively affects balance in CAI patients during eyes-closed. Sensory reweighting as a rehabilitative tool to challenge postural control may be more effective with eyes-closed.