Effect of Transcutaneous Electrical Nerve Stimulation on Gait Kinematics in Subjects with Anterior Knee Pain

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Context: Knee pain is 1 of 5 leading causes of disability among adults. Knee pain alters lower-extremity muscle function and gait mechanics. While transcutaneous electrical nerve stimulation (TENS) mitigates deficits of muscle activation due to pain, it is unclear whether TENS improves walking mechanics. **Objective:** To examine the effect of TENS on gait kinematics in subjects with anterior knee pain. **Design:** Crossover. **Setting:** Controlled laboratory. **Patients or other Participants:** Thirty university students participated: fifteen subjects (24±3 yrs, 71±12 kg, 178±7 cm) were assigned to the TENS group, after which subjects were matched by gender, age, mass, height for the placebo TENS group (23±2 yrs, 72±14 kg, 177±9 cm). **Interventions:** All subjects underwent 3 different experimental conditions (hypertonic, isotonic, control) in a counterbalanced order, separated by 48 hours. Hypertonic (5% NaCl) or isotonic (0.9% NaCl) saline was infused into the right infrapatellar fat pad for 50 min for the pain or sham condition. No infusion was administered to the control condition. Subjects and investigators were blinded regarding the saline solution which was being infused. A 20-min TENS or placebo TENS treatment was administered. The treatment was blinded to subjects. Gait kinematic data were collected using the high-speed video (240 Hz) and force-sending tandem treadmill (1200 Hz) at a self-selected walking speed for 30 sec at four times (baseline, infusion, treatment, post-treatment). Functional linear models (α=0.05) were used to evaluate difference between treatment groups (TENS, placebo) over time for lower-extremity joint kinematics. This analysis compared variables as polynomial functions rather than discrete values. Functions (mean curve) were compared between groups and conditions over times during stance (0% = heel-strike, 100% = toe-off). Pairwise comparison functions with 95% confidence interval (CI) bands were plotted to determine specific difference. If the function difference with 95% CI bands did not cross zero, then significant difference existed. **Main Outcome Measures:** Ankle angle (sagittal, frontal), knee angle (sagittal, frontal), and hip angle (sagittal, frontal). **Results:** The functional analyses revealed no group x time interaction for ankle, knee, and hip kinematic functions. Hypertonic saline infusion (pain) gave rise to an increase in: (1) ankle dorsiflexion at 38-75% of stance, (2) knee valgus at 20-40% of stance, (3) knee flexion at 40-90% of stance, (4) hip adduction at 72-100% of stance, and (5) hip flexion at 50-90% of stance. **Conclusions:** Our findings suggest knee pain acutely changed lower-extremity gait mechanics. Altered gait strategies may play a role in long-term compensation that could have consequences for the joint. TENS treatment, however, did not acutely reduce the deficits in aforementioned kinematic variables. Future research is needed to examine other therapeutic interventions that may reduce the deficits in altered gait mechanics due to pain.