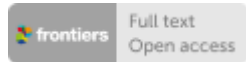
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The effects of pulsed electromagnetic field therapy on muscle strength and pain in patients with end-stage knee osteoarthritis: a randomized controlled trial

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Abstract

Background: Osteoarthritis (OA) of the knee is one of the most common chronic degenerative joint conditions affecting aging population.

Aim: To investigate the effectiveness of a combination of home-based exercise and pulsed electromagnetic field (PEMF) therapy to improve muscle strength, physical function, and pain.

Methods: Sixty patients were randomly assigned to either home-based exercise alone (control group; $n = 30$) or combined with PEMF therapy (treatment group; $n = 30$) twice a week for eight weeks. Knee extension, flexion muscle strength, gait speed (GS), 5 time sit-to-stand test (5STS), Visual Analogue Scale (VAS) pain and Knee Injury and Osteoarthritis Outcome Score (KOOS) were recorded at baseline and 4 and 8 weeks.

Results: Significant improvements in symptomatic knee extension muscle strength (SKE, $p = 0.001$), flexion strength (SKF, $p = 0.011$), contralateral knee extension muscle strength (CKE, $p = 0.002$), and flexion strength (CKF, $p = 0.009$) were observed for the PEMF treatment group at 8 weeks. Significant reductions in VAS pain scores were observed in both the treatment ($p < 0.001$, partial $\eta^2 = 0.505$) and control ($p < 0.001$, partial $\eta^2 = 0.268$) groups. Significant differences were reported between groups in the 4 ($p = 0.010$, partial $\eta^2 = 0.111$) and 8 ($p = 0.046$, partial $\eta^2 = 0.068$) week assessment in VAS pain. A significant time difference was found in GS and 5STS between baseline and week 8 (GS: difference 0.051, $p = 0.026$; 5STS: difference 2.327, $p < 0.001$) in the treatment group. The significant group difference at week 8 was observed in SKE ($p = 0.013$) in female patients while pain in male patients ($p = 0.026$). Patients aged over 70 years have a significantly superior improvement in SKE, SKF, and CKF after 8 weeks of PEMF therapy.

Conclusion: The combination of PEMF therapy and home-based exercise superiorly improved knee muscle strength and reduced pain in end-stage knee OA subjects and showed a promising tendency to improve performance-based physical function. PEMF therapy was shown to preferentially benefit knee muscle strength in female patients and patients aged over 70 years, whereas male patients were more responsive to PEMF therapy in the form of pain relief.

Clinical trial registration: [clinicalTrials.gov](https://clinicaltrials.gov), [NCT05550428](https://clinicaltrials.gov/ct2/show/study/NCT05550428).

Keywords: PEMF therapy; end-stage knee osteoarthritis; knee extensor muscle strength; knee flexor muscle strength; pain.

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Figures



Figure 1 The PEMF device.

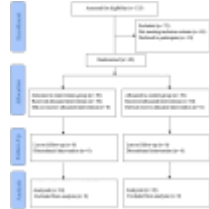


Figure 2 CONSORT flow diagram.

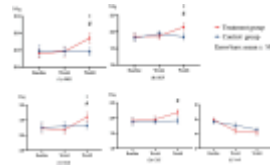


Figure 3 The within-group difference in knee...

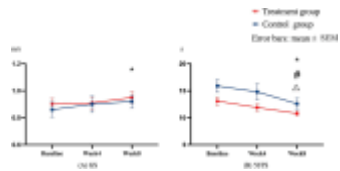


Figure 4 Within-group difference in GS and...

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