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Original Article

Effectiveness of Osteopathic Manipulative Treatment Versus Craniosacral Therapy in Enhancing Quality of Life, Functional Mobility, and Motor Function in Parkinson's Disease Patients

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ABSTRACT

Background: Parkinson's disease is a progressive neurodegenerative disorder associated with motor impairment, reduced functional mobility, and diminished quality of life. Manual therapies such as osteopathic manipulative treatment and craniosacral therapy have been proposed as adjunctive approaches in Parkinson's disease rehabilitation, but comparative evidence remains limited. Objective: To compare the effects of osteopathic manipulative treatment and craniosacral therapy on quality of life, functional mobility, and motor function in patients with idiopathic Parkinson's disease. Methods: This single-blind randomized controlled trial enrolled 54 adults with idiopathic Parkinson's disease, Hoehn and Yahr stages II–III. Participants were allocated equally to osteopathic manipulative treatment, craniosacral therapy, or standard-care control groups. Manual therapy interventions were delivered twice weekly for 10 weeks. Outcomes were assessed at baseline and post-intervention using the Parkinson's Disease Questionnaire-39, Timed Up and Go test, and Unified Parkinson's Disease Rating Scale Part III. Results: Both manual therapy groups showed greater numerical improvement than control. Craniosacral therapy showed larger mean improvement in PDQ-39 total score (-12.8) and emotional well-being (-4.9), while osteopathic manipulative treatment showed larger mean improvement in Timed Up and Go (-2.7 seconds) and UPDRS Part III (-7.3). Control-group changes were minimal across outcomes. Conclusion: Osteopathic manipulative treatment and craniosacral therapy may provide adjunctive benefits in Parkinson's disease rehabilitation, with domain-specific response patterns. Larger trials with complete inferential reporting and long-term follow-up are required. Keywords: Parkinson's disease, osteopathic manipulative treatment, craniosacral therapy, quality of life, functional mobility, motor function, PDQ-39, Timed Up and Go, UPDRS.

INTRODUCTION

Parkinson's disease is a progressive neurodegenerative disorder and one of the most common movement disorders worldwide, primarily characterized by dopaminergic neuronal degeneration within the substantia nigra and associated dysfunction of basal ganglia motor circuitry (1). Clinically, the disease presents with bradykinesia, rigidity, resting tremor, postural instability, gait disturbance, and progressive impairment in functional independence, all of which contribute substantially to reduced quality of life

and increased caregiver burden (2). Although pharmacological treatment, particularly dopaminergic therapy, remains the cornerstone of Parkinson's disease management, many patients continue to experience persistent motor impairment, postural instability, mobility limitation, musculoskeletal rigidity, and non-motor symptoms despite optimized medical care (3). These limitations have increased interest in adjunctive rehabilitative and manual therapy approaches that may complement standard care by targeting biomechanical, neuromuscular, proprioceptive, and psychosocial dimensions of Parkinson's disease.

Osteopathic manipulative treatment is a hands-on therapeutic approach that uses manual techniques directed at musculoskeletal alignment, soft-tissue mobility, joint restriction, fascial tension, and neuromuscular function (4). In neurological and musculoskeletal populations, osteopathic approaches have been proposed to influence mobility, postural control, pain, rigidity, and sensorimotor integration through mechanical and neurophysiological pathways (5). In Parkinson's disease, emerging clinical evidence suggests that osteopathic manipulative treatment may have potential benefits for gait parameters, balance, rigidity, and functional movement; however, available studies remain limited by small samples, heterogeneous protocols, and incomplete comparative evidence (6). Craniosacral therapy is another gentle manual therapy approach that focuses on cranial, spinal, and sacral structures and has been proposed to influence autonomic regulation, relaxation responses, perceived well-being, pain modulation, and quality-of-life domains in chronic neurological conditions (7). Its use in Parkinson's disease remains less established than conventional rehabilitation approaches, and much of the rationale is based on proposed neurophysiological and psychosocial mechanisms rather than robust comparative clinical trials (8).

Despite the increasing use of manual therapies as adjunctive interventions in neurorehabilitation, there remains limited head-to-head evidence comparing osteopathic manipulative treatment and craniosacral therapy in patients with Parkinson's disease. This gap is clinically important because these therapies may affect different outcome domains: osteopathic manipulative treatment may be more directly related to mobility and motor function, whereas craniosacral therapy may be more relevant to perceived quality of life and psychosocial well-being. A comparative evaluation using standardized Parkinson's disease outcome measures can therefore help clarify whether these approaches offer distinct or overlapping benefits when added to usual care. The present randomized controlled trial was designed to compare the effects of osteopathic manipulative treatment and craniosacral therapy on quality of life, functional mobility, and motor function in adults with idiopathic Parkinson's disease, using the Parkinson's Disease Questionnaire-39, Timed Up and Go test, and Unified Parkinson's Disease Rating Scale Part III as outcome measures (9).

MATERIALS AND METHODS

This study was conducted as a single-blind, randomized controlled trial comparing osteopathic manipulative treatment, craniosacral therapy, and standard-care control in adults with idiopathic Parkinson's disease. Eligible participants were men and women aged 50 to 80 years with a clinical diagnosis of idiopathic Parkinson's disease, Hoehn and Yahr stage II–III disease severity, a stable medication regimen for at least eight weeks before enrolment, and the ability to ambulate independently with or without an assistive device. Participants were excluded if they had undergone deep brain stimulation surgery within the previous year, had severe cognitive impairment defined as Mini-Mental State Examination score below 24, or had another neurological disorder that could independently affect mobility, motor function, or interpretation of Parkinson's disease-related outcomes.

Fifty-four eligible participants were enrolled and randomly allocated into three equal groups: osteopathic manipulative treatment, craniosacral therapy, and control, with 18 participants assigned to each group. Random allocation was performed using a computer-generated sequence. Outcome assessment was conducted by assessors blinded to group allocation to reduce measurement bias.

Participants in the osteopathic manipulative treatment group received a standardized manual therapy protocol directed at the cervical, thoracic, and lumbar spinal regions, pelvis, and associated soft tissues, with the therapeutic aim of improving neuromuscular balance, tissue mobility, and functional movement. Each session lasted 45 minutes and was delivered twice weekly for 10 weeks. Participants in the craniosacral therapy group received craniosacral techniques focused on cranial, spheno-occipital, and sacroiliac regions with the aim of supporting craniosacral rhythm, relaxation, and autonomic regulation. The craniosacral therapy schedule matched the osteopathic manipulative treatment schedule, with 45-minute sessions delivered twice weekly for 10 weeks. Participants in the control group continued standard Parkinson's disease care, including medication and prescribed physical therapy, but did not receive osteopathic manipulative treatment or craniosacral therapy during the intervention period.

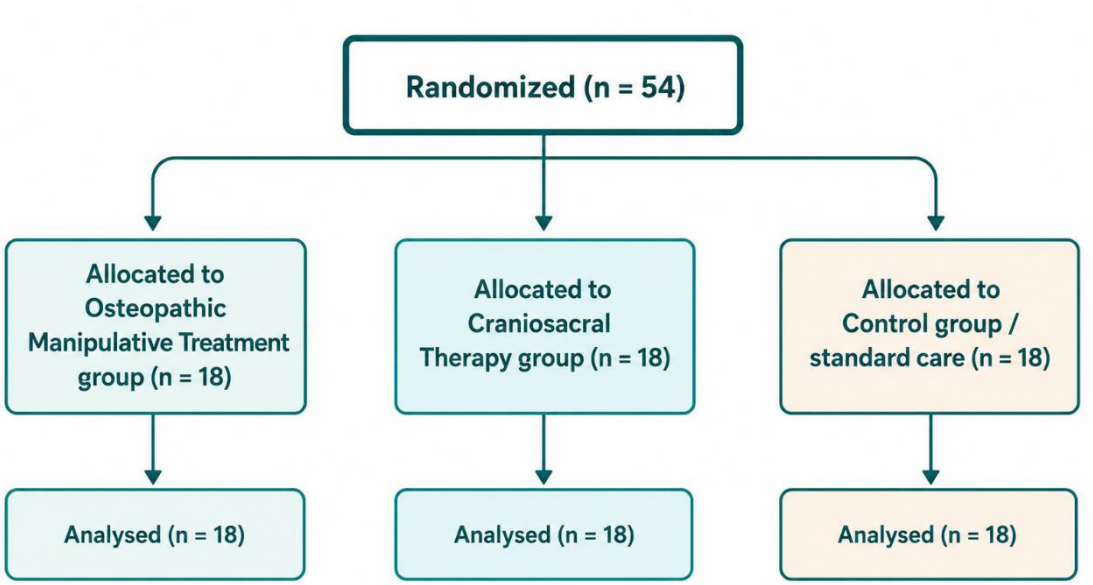

Figure 1 CONSORT Flowchart

Outcome assessments were performed at baseline and after completion of the 10-week intervention period. Quality of life was assessed using the Parkinson's Disease Questionnaire-39, including total score and relevant subscale scores. Functional mobility was assessed using the Timed Up and Go test, recorded in seconds, with lower scores indicating better mobility performance. Motor function was assessed using the Unified Parkinson's Disease Rating Scale Part III, with lower post-intervention scores indicating improvement in motor impairment. Baseline demographic and clinical characteristics included age, sex distribution, group allocation, and Hoehn and Yahr disease stage. The primary outcome domain was quality of life as measured by the Parkinson's Disease Questionnaire-39, while functional mobility and motor function were evaluated as key secondary outcome domains.

Data were analyzed using SPSS. 26.0 Continuous variables were summarized as mean ± standard deviation, and categorical variables were summarized as frequencies and group distributions. Repeated-measures analysis of variance was used to examine within-group changes over time and between-group differences across the three study arms from baseline to post-intervention assessment. Statistical significance was set at $p<0.05$. The analysis focused on baseline-to-post-intervention changes in Parkinson's Disease Questionnaire-39 scores, Timed Up and Go performance, and Unified Parkinson's Disease Rating Scale Part III scores across osteopathic manipulative treatment, craniosacral therapy, and standard-care control groups.

RESULTS

A total of 54 participants were included, with equal allocation across the OMT, CST, and control groups. Mean age was comparable across groups, ranging from 66.2 ± 8.1 years in the CST group to 68.1 ± 6.9 years in the control group. Sex distribution was also broadly balanced, with 10 males and 8 females in the OMT group, 11 males and 7 females in the CST group, and 9 males and 9 females in the control group. All groups included participants with Hoehn and Yahr stage II–III Parkinson's disease.

Table 1. Baseline Characteristics of Participants by Study Group

Variable	OMT Group	CST Group	Control Group
Participants, n	18	18	18
Age, Mean ± SD, years	67.4 ± 7.6	66.2 ± 8.1	68.1 ± 6.9
Male, n	10	11	9
Female, n	8	7	9
Hoehn and Yahr stage	II–III	II–III	II–III

OMT: osteopathic manipulative treatment; CST: craniosacral therapy; SD: standard deviation.

Table 2. Quality of Life Outcomes Using PDQ-39 Scores

Measure	OMT Pre, Mean ± SD	OMT Post, Mean ± SD	OMT Change	CST Pre, Mean ± SD	CST Post, Mean ± SD	CST Change	Control Pre, Mean ± SD	Control Post, Mean ± SD	Control Change
PDQ-39 Total	45.1 ± 11.3	35.2 ± 10.1	-9.9	44.3 ± 12.0	31.5 ± 11.4	-12.8	46.4 ± 10.9	45.8 ± 11.2	-0.6
Emotional Well-Being	12.7 ± 4.6	9.3 ± 4.0	-3.4	13.1 ± 4.4	8.2 ± 4.1	-4.9	12.9 ± 4.8	12.6 ± 4.9	-0.3

PDQ-39: Parkinson's Disease Questionnaire-39; OMT: osteopathic manipulative treatment; CST: craniosacral therapy; SD: standard deviation. Change was calculated as post-intervention mean minus baseline mean.

Quality of life improved in both intervention groups, with larger reductions in PDQ-39 total scores than in the control group. The OMT group showed a mean PDQ-39 total score change of -9.9 points, while the CST group showed a larger mean change of -12.8 points. The control group showed minimal change, with a mean difference of -0.6 points. Emotional well-being scores followed a similar pattern, with changes of -3.4 in the OMT group, -4.9 in the CST group, and -0.3 in the control group. These findings suggest that both manual therapy interventions were associated with improved quality-of-life scores, with numerically greater improvement in the CST group for PDQ-39 total and emotional well-being domains.

Table 3. Functional Mobility Outcomes Using Timed Up and Go Test

Group	Pre, Mean ± SD, seconds	Post, Mean ± SD, seconds	Change, seconds
OMT	14.8 ± 3.5	12.1 ± 2.8	-2.7
CST	15.2 ± 3.3	13.8 ± 3.0	-1.4
Control	14.9 ± 3.6	14.5 ± 3.5	-0.4

OMT: osteopathic manipulative treatment; CST: craniosacral therapy; SD: standard deviation. Change was calculated as post-intervention mean minus baseline mean.

Functional mobility improved more clearly in the intervention groups than in the control group. The OMT group demonstrated the largest reduction in Timed Up and Go performance time, decreasing from 14.8 ± 3.5 seconds to 12.1 ± 2.8 seconds, with a mean change of -2.7 seconds. The CST group improved from 15.2 ± 3.3 seconds to 13.8 ± 3.0 seconds, with a mean change of -1.4 seconds. The control group showed only a small change of -0.4 seconds. The numerical pattern indicates greater mobility improvement in the OMT group compared with CST and control groups.

Motor function improved in both intervention groups, with the largest numerical reduction observed in the OMT group. UPDRS Part III scores decreased by -7.3 points in the OMT group, compared with -4.5 points in the CST group and -1.1 points in the control group. The magnitude of mean change suggests

that OMT was associated with greater improvement in motor impairment than CST, while both interventions showed larger improvement than control care.

Table 4. Motor Function Outcomes Using UPDRS Part III

Group	Pre, Mean ± SD	Post, Mean ± SD	Change
OMT	28.4 ± 6.7	21.1 ± 5.8	-7.3
CST	29.1 ± 7.1	24.6 ± 6.4	-4.5
Control	28.9 ± 6.9	27.8 ± 6.8	-1.1

UPDRS: Unified Parkinson's Disease Rating Scale; OMT: osteopathic manipulative treatment; CST: craniosacral therapy; SD: standard deviation. Change was calculated as post-intervention mean minus baseline mean.

Table 5. Summary of Baseline-to-Post-Intervention Mean Changes Across Outcomes

Outcome	OMT Change	CST Change	Control Change
PDQ-39 Total	-9.9	-12.8	-0.6
PDQ-39 Emotional Well-Being	-3.4	-4.9	-0.3
TUG, seconds	-2.7	-1.4	-0.4
UPDRS Part III	-7.3	-4.5	-1.1

PDQ-39: Parkinson's Disease Questionnaire-39; TUG: Timed Up and Go; UPDRS: Unified Parkinson's Disease Rating Scale; OMT: osteopathic manipulative treatment; CST: craniosacral therapy. Negative change indicates reduction in score or time from baseline to post-intervention.

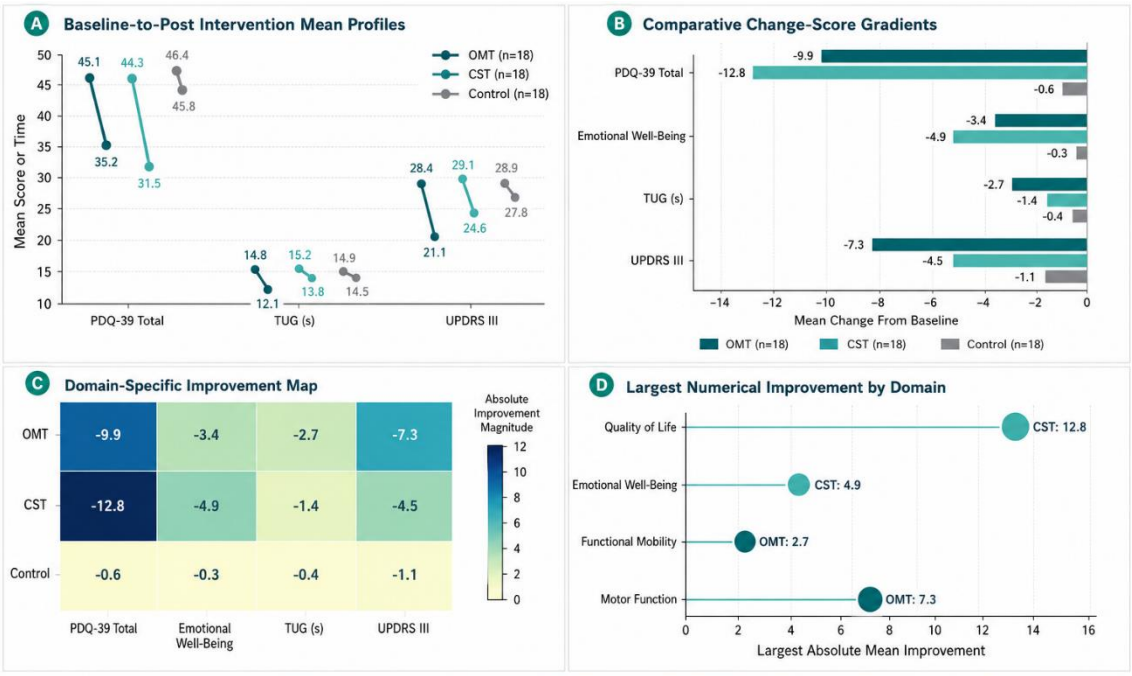

Figure 2 Comparative response patterns after manual therapy interventions in Parkinson's disease. Panel A shows baseline-to-post intervention mean profiles for PDQ-39 Total, Timed Up and Go, and UPDRS Part III across the OMT, CST, and control groups. Panel B displays mean change scores across quality-of-life, emotional well-being, mobility, and motor-function outcomes, where negative values indicate improvement. Panel C summarizes domain-specific improvement magnitude across groups, and Panel D highlights the largest numerical improvement by clinical domain. CST showed the greatest numerical improvement in PDQ-39 Total and Emotional Well-Being scores, whereas OMT showed the greatest numerical improvement in Timed Up and Go performance and UPDRS Part III motor scores. OMT: osteopathic manipulative treatment; CST: craniosacral therapy; PDQ-39: Parkinson's Disease Questionnaire-39; TUG: Timed Up and Go; UPDRS III: Unified Parkinson's Disease Rating Scale Part III.

Across outcome domains, the CST group showed the largest numerical improvement in quality-of-life outcomes, with a -12.8-point change in PDQ-39 total score and a -4.9-point change in emotional well-being. The OMT group showed the largest numerical improvement in physical performance outcomes, with a -2.7-second change in Timed Up and Go and a -7.3-point change in UPDRS Part III. The control

group showed minimal changes across all outcomes, ranging from -0.3 to -1.1. These findings indicate domain-specific response patterns, with CST showing greater numerical improvement in quality-of-life measures and OMT showing greater numerical improvement in functional mobility and motor function.

DISCUSSION

The present randomized controlled trial compared osteopathic manipulative treatment, craniosacral therapy, and standard care in patients with idiopathic Parkinson's disease and demonstrated greater numerical improvement in both manual therapy groups than in the control group across quality-of-life, functional mobility, and motor-function outcomes. The response pattern differed across clinical domains. Craniosacral therapy showed larger numerical improvement in PDQ-39 total score and emotional well-being, whereas osteopathic manipulative treatment showed larger numerical improvement in Timed Up and Go performance and UPDRS Part III motor scores. These findings suggest that both manual therapy approaches may offer adjunctive value in Parkinson's disease rehabilitation, but claims of comparative superiority should remain cautious because exact between-group p-values, confidence intervals, interaction statistics, and post-hoc pairwise comparisons were not reported.

The larger numerical reduction in PDQ-39 total and emotional well-being scores in the craniosacral therapy group suggests a possible effect on patient-reported quality-of-life domains. Parkinson's disease produces a broad clinical burden that extends beyond bradykinesia, rigidity, tremor, and postural instability to include emotional distress, reduced social participation, sleep disturbance, fatigue, and reduced perceived autonomy. Because the PDQ-39 captures multidimensional patient-perceived burden, the observed improvement in the craniosacral therapy group may reflect changes in relaxation, perceived symptom control, psychosocial well-being, or treatment-related contextual effects. However, the mechanisms of craniosacral therapy in Parkinson's disease remain insufficiently established, and these findings should be interpreted as exploratory rather than confirmatory.

Osteopathic manipulative treatment showed the largest numerical improvement in functional mobility and motor impairment. The Timed Up and Go score improved by -2.7 seconds in the osteopathic manipulative treatment group, compared with -1.4 seconds in the craniosacral therapy group and -0.4 seconds in the control group. Similarly, UPDRS Part III scores improved by -7.3 points in the osteopathic manipulative treatment group, compared with -4.5 points in the craniosacral therapy group and -1.1 points in the control group. This pattern is clinically plausible because osteopathic manipulative treatment directly targets musculoskeletal restriction, soft-tissue mobility, postural mechanics, spinal and pelvic mobility, and neuromuscular function. In Parkinson's disease, rigidity, impaired trunk rotation, altered postural control, and bradykinesia contribute substantially to reduced movement efficiency; therefore, manual treatment directed toward biomechanical and neuromuscular limitations may support mobility-related improvements.

The distinction between outcome domains has potential clinical relevance. Craniosacral therapy appeared numerically more favorable for quality-of-life and emotional well-being outcomes, whereas osteopathic manipulative treatment appeared numerically more favorable for mobility and motor-function outcomes. This may help clinicians consider patient-specific treatment priorities when integrating adjunctive manual therapy into multidisciplinary Parkinson's disease care. Patients with greater perceived quality-of-life burden or emotional well-being concerns may potentially benefit from gentle manual approaches emphasizing relaxation and comfort, while those with greater mobility limitation, rigidity, or motor impairment may potentially benefit from structurally oriented osteopathic approaches. This interpretation should not be used as a definitive treatment rule because the study did not provide direct inferential evidence confirming differential treatment effects across domains.

The findings support the broader role of adjunctive, individualized rehabilitation strategies in Parkinson's disease. Standard management remains centered on pharmacological therapy, exercise-

based rehabilitation, gait training, balance training, fall prevention, and functional independence. Manual therapies may be considered complementary interventions when musculoskeletal stiffness, postural dysfunction, pain, reduced mobility, or reduced perceived well-being persist despite usual care. In the present study, both manual therapy groups showed more favorable numerical changes than the control group, while the control group showed only minimal changes across outcomes. These results suggest possible clinical utility but should be confirmed with stronger statistical reporting and longer-term follow-up before firm conclusions are drawn.

This study has several limitations. The sample size was modest, with 18 participants in each group, which limits statistical power and precision. The manuscript did not report a sample-size calculation, trial registration, allocation concealment, therapist training, treatment fidelity checks, adherence rates, adverse events, or missing-data handling. Blinding of participants and therapists is difficult in manual therapy trials, increasing the possibility of performance and expectation bias. The control group continued standard care, but the intensity and content of physical therapy or other co-interventions were not fully described, which limits interpretation of the independent effects of osteopathic manipulative treatment and craniosacral therapy. The absence of long-term follow-up also prevents assessment of whether the observed improvements were sustained beyond the 10-week intervention period. Future randomized trials should include larger samples, concealed allocation, standardized co-intervention monitoring, intention-to-treat analysis, adverse-event reporting, effect sizes with 95% confidence intervals, exact interaction statistics, and follow-up assessments.

CONCLUSION

Osteopathic manipulative treatment and craniosacral therapy were both associated with greater numerical improvement than standard care in patients with idiopathic Parkinson's disease. Craniosacral therapy showed larger numerical improvement in PDQ-39 total and emotional well-being scores, whereas osteopathic manipulative treatment showed larger numerical improvement in Timed Up and Go performance and UPDRS Part III motor scores. These findings suggest that manual therapy approaches may provide adjunctive, domain-specific benefits within multidisciplinary Parkinson's disease rehabilitation. However, because exact inferential statistics, allocation concealment details, adverse-event data, and long-term follow-up were not reported, the findings should be interpreted cautiously and confirmed through larger, methodologically rigorous randomized controlled trials.

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