Self-Administered Traction as an Adjunct in the Chiropractic Treatment of Low Back Pain: A Case Report

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Abstract

Objective: The purpose of this case report is to describe self-administered lumbar traction as a component of the treatment of a patient with low back pain (LBP).

Clinical Features: A 41-year-old male chiropractic student presented with an exacerbation of intermittent LBP of approximately 2 years duration. Pain intensity was 4 to 8/10 on a verbal pain scale the day after exertion and 10 on the Patient Reported Outcomes Measurement Information System (PROMIS) 3a. Pain interference was 15 on the PROMIS-8a. The Oswestry Disability Index was 30%. Radiographs showed mild bilateral arthritic changes throughout the lumbar spine and sacroiliac joints. Diagnoses of acute exacerbation of recurrent, mechanical low back pain with thoracic and lumbar segmental dysfunction, lumbosacral spondylosis without myelopathy, and bilateral sacroiliac joint arthritis were made.

Intervention and Outcomes: The student received 14 treatments over 5 weeks consisting of spinal manipulation and therapeutic exercises in conjunction with clinician-supervised, self-administered traction. After 14 treatments, the patient was discharged, reporting resolution of LBP (pain intensity [PROMIS-3a] = 4; pain interference [PROMIS-8a] = 8; Oswestry 2%; and increased range of motion). Pain resolution remained for more than 2 years without additional treatment (pain intensity = 3; pain interference = 8; Oswestry 0%; continued increased range of motion).

Conclusion: The patient reported long-term benefit from a course of spinal manipulation and therapeutic exercises in conjunction with novel self-administered traction with flexion. (J Chiropr Med 2024;23;205-214)

Key Indexing Terms: *Low back pain; Chiropractic; Traction; Spine; Case report*

Introduction

Low back pain (LBP) affects people of all ages, is the leading cause of disability worldwide,[1] and has important socioeconomic consequences. Additionally, LBP frequently results in the reduction of health-related quality of life.[2]

Doctors of chiropractic (DCs) are healthcare providers that are frequently the first providers sought to treat LBP.[3] Chiropractic medicine is a multimodal care model[4,5] and interventions used by DCs in the treatment of a typical case of LBP include: spinal manipulative therapy (SMT); physical therapy and rehabilitative exercises; and nutrition. SMT has been shown to improve patient outcomes for those who have acute and chronic LBP.[6-11] SMT has also been shown to improve range of motion[12-15] and decrease pain.[16,17] Preliminary studies show potential additional effects on reduction of joint position sense errors,[18,19] improvement of reaction times,[20] increased lower extremity muscle strength,[21-23] and improvement of generalized spinal function.[24-29]

Various forms of traction have been found to provide therapeutic benefit in the care of LBP.[30,31] There are already devices that have documented success treating LBP using clinician-administered traction[32] and flexion and traction.[33-35] Clinician administered flexion combined with traction has been shown to provide more pain relief than the active trunk exercise protocol (ATEP) in the treatment of LBP.[35] However, to our knowledge, there are no studies assessing self-administered, modulated-force traction combined with lumbar flexion for LBP. The term modulated-force is used in this paper to indicate that the amount of force used for traction is determined (modulated) by the patient. This is in contradistinction to inversion therapy where the patient is also able to initiate the traction, but modulation of the force is either not possible, or less precise, depending on the device.[36,37] Continuous-force,

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Paper submitted October 5, 2023; in revised form August 21, 2024; accepted August 21, 2024.
1556-3707

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https://doi.org/10.1016/j.jcm.2024.08.005

self-administered cervical traction has been used for decades (e.g., "over-the-door" units) and several studies have been published assessing such traction;[38-41] but to our knowledge, with the exception of inversion therapy,[36,37] there are no peer-reviewed studies assessing self-administered lumbar traction.

The purpose of this paper is to report the incorporation of self-administered, modulated-force lumbar traction as a component of a course of chiropractic care for a patient with LBP.

Case Presentation

The patient is one of the authors (DM) and gave consent to have personal health information published.

This case report was prepared following the CARE Guidelines.[42,43]

Chief Complaint and History

A 41-year-old, male presented with an exacerbation of intermittent LBP of approximately 2 years duration. He was a firefighter and previously a carpenter and Golden Gloves boxer; all activities required intense physical activity and training. He had recently increased physical activity to prepare for requalification as a firefighter. Episodes of LBP were very frequent and had been becoming more frequent to the point that he could not exercise and was aware of pain "more frequently than pain being absent." He had pain bilaterally from the thoracolumbar junction, inferiorly to the sacroiliac joints. The pain sometimes referred to the front of the pelvis to the pubic symphysis. The pain was "achy, deep," causing him to have difficulty standing upright. Jogging caused 4/10 pain (0 being no pain, and 10 being the worst pain imaginable) on a verbal numeric pain rating scale. Sprinting caused 8/10 pain with some additional sharp deep pain bilaterally in the region of the hip (coxofemoral) joints. Rapidly lifting a 40-pound weight overhead caused deep pain in the lumbar region of 4 to 8/10 the day after, and was the primary reason he was seeking treatment. He had previously received treatment using SMT, which helped, but the discomfort returned within several days to weeks.

Examination

The patient was 70 inches in height, weighed 185 lbs, and had a BMI of 26.54. No gait abnormalities were seen during visual inspection. A slight loss of the lumbar lordosis was noted, the right shoulder was slightly elevated, and the left anterior superior iliac crest was also elevated. Motor strength assessed for hip flexion, knee extension, ankle dorsiflexion, hallux extension, ankle plantar flexion, and knee flexion were 5/5 bilaterally; with the exception of left hip flexion and left plantar flexion, which were both assessed as 4/5.

Table 1 shows the results for the Patient Reported Outcomes Measurement Information System (PROMIS) scores (pain intensity, and pain interference), Oswestry Disability Index, motion palpation, thoracolumbar ranges of motion measured standing with a goniometer (Prestige Medical, Northridge), and the (10) orthopedic tests that tested positive during the examination.

Due to the chronic nature of the complaint and the patient's intense physical work and training; radiographs were taken to rule out premature degeneration of the lumbosacral region and/or hip joints, loss of disc height, or (less likely) fracture. Multiview imaging of the lumbar spine, sacroiliac joints, and bilateral hip joints was performed and revealed mild arthritic changes throughout the lumbar spine and bilaterally in the sacroiliac joints (Fig 1).

Diagnosis

The diagnoses were: acute exacerbation of recurrent, mechanical LBP; thoracic and lumbar segmental dysfunction; lumbosacral spondylosis without myelopathy; and bilateral sacroiliac joint arthritis.

Treatment

Fourteen treatments, each consisting of SMT and in-office self-administered traction, were given over the course of 5 weeks. The traction device was designed to provide self-administered traction during lumbar flexion. The SMT procedures[44] were provided by the supervising clinician (AS), who had over 16 years of clinical experience performing the procedures. Table 2 provides a description of the SMT used in this case.

Therapeutic exercises were performed by the patient. These were gradually introduced and the repetitions were increased each week. Table 3 shows the exercises performed during the final week of care, which represents the maximum exercises performed during the treatment program.

Once SMT and exercises and stretching were completed during each visit, the patient did the self-administered traction under the direct supervision of the clinician. This began with the patient positioning himself supine on the floor of the treatment room with his pelvis as close to the base of the device carriage arm as possible (Fig 2). The knee bolster was adjusted so that the knees fit over the bolster with the legs flexed (plantar surface of the feet comfortably resting on the floor) and the hips in contact with the floor. He pulled the handle to his chest, which

Table 1. *Examination Findings at Initial Exam and After 5 Weeks (14 Treatments) and 29 Months of Treatment*

Test or Questionnaire	Initial Exam	Following Care (14 Treatments)	29 Month Follow-Up
Pain intensity (PROMIS 3a, v2.0) (Scale = 3 (no pain)—15 [very severe pain])	10 (moderate to severe pain)	4 (mild to no pain)	3 (no pain)
Pain interference (PROMIS 8a, v2.0) (Scale = 8 ["Not at all" interference]—40 ["Very much" interference])	15 (slight interference)	8 (no interference)	8 (no interference)
Oswestry Disability Index	30% (moderate disability)	2% (minimal disability)	0% (no disability)
Thoracolumbar active ROMs (degrees, measured by goniometer)	Flexion—80 Extension—23 Right rotation—33 Left rotation—30 Lateral flexion—35 bilaterally	Flexion—92 Extension—30 Right rotation—35 Left rotation—35 Lateral flexion—35 bilaterally	Flexion—95 Extension—30 Right rotation—35 Left rotation—35 Lateral flexion—35 bilaterally
Motion palpation	Hypertonicity paraspinal muscles lower thoracic and lumbar regions (T10-sacrum) Tenderness upon paraspinal muscle palpation—level of L4. Restriction noted upon extension—T10-T12, L1-L5, and right sacroiliac joint	Hypertonicity remained No tenderness Restrictions noted upon extension—T11-T12, L4-L5, and the right sacroiliac joint	Minimal hypertonicity, paraspinal muscles midthoracic (T5-T7 region) No tenderness Restrictions noted upon extension—T5-T6, T10, and the left sacroiliac joint
Positive orthopedic tests	Piedallu's (right posterior superior iliac spine [PSIS] raised higher than left during seated flexion) Kemp's seated (right lumbosacral region, no radicular pain) Slump test seated (left lumbosacral pain with left knee extension) Anvil test (bilateral acetabular pain) Thomas' test (thigh elevation bilaterally) Ely's test (right sacroiliac pain) Nachlas' test (elicited LBP on right side) Yeoman's test (bilateral sacroiliac joint pain) Gaenslen's test (right-sided sacroiliac joint pain) Iliac compression test (right-sided sacroiliac joint pain)	Piedallu's (right PSIS raised higher than the left) Thomas' (very slightly positive on the right)	Piedallu's (left PSIS raised higher than the right) Thomas' test (thigh elevation, bilaterally)

elevated the knees and pelvis, creating distraction and flexion of the lumbar region. He held this position for 2 seconds, then released for 2 seconds. Each pull was done with moderate speed, deliberately maintaining the same speed throughout the pull, and breathing in deeply during the pull and exhaling as the handle was released. The patient was instructed that the force generated by his pull should not exceed what was comfortable. Two sets of 10 repetitions were completed with a brief rest period (30 seconds to 1 minute) between sets.

Outcomes

The patient missed no scheduled visits and reported that the treatments were well-tolerated. An unanticipated event occurred the morning following the second

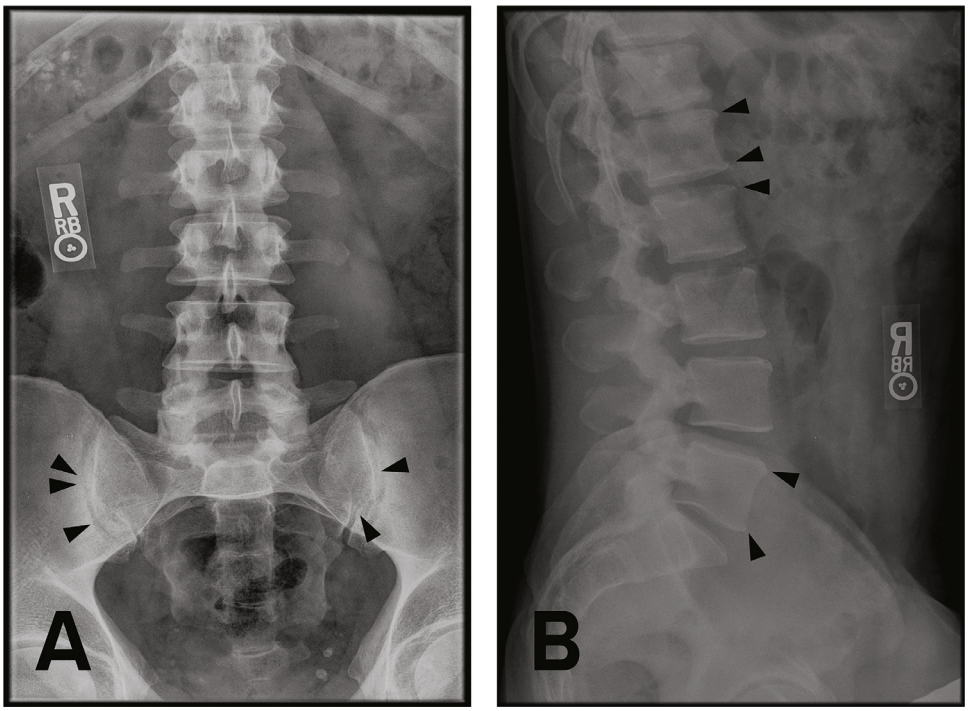

Fig 1. *Anterior-posterior (AP) (A) and right lateral (B) views of the lumbar spine and pelvis of the patient. The lateral view shows mild anterior spondylophytes indicating mild degenerative changes at several vertebral levels (arrowheads). The AP view shows mild degenerative changes of the sacroiliac joints bilaterally (arrowheads).*

treatment; the patient reported a "fatigue and fullness in his spine" while he lay supine in his bed. The patient indicated that the sensation was not in the (paraspinal) muscles but, by his perception, in the spine itself. The patient reported that after getting up from bed the unique sensations dissipated within 2 hours and never returned. The feeling was not unpleasant, and the patient interpreted the sensation as a positive finding because he had received SMT many times before and had not experienced this

Table 2. *Spinal Manipulative Therapy (SMT) Administered*[a]

Region	Procedure
T7-T8	Patient prone Bilateral hypothenar contact over transverse processes Posterior to anterior (P-A), and inferior to superior (I-S) thrust
L2-L5	Right side-posture (right side down) Reinforced index "mammillary contact" "Kick-pull" A-P, I-S thrust (knee-to-knee, digit pull motion)
Right sacroiliac joint	Left side-posture Hypothenar contact on right posterior superior iliac spine P-A, I-S thrust
Bilateral hip distraction	Supine Long axis distraction using a bilateral hand contact surrounding the patient's knee

[a] Most frequent SMT administered; modifications were made per treatment, based upon palpation.

Table 3. *Therapeutic Exercises Administered*[a,b]

Region	Exercise
Lateral hip rotators (stretching)	Supine, medial hip rotation, 30 seconds/side, 2 repetitions, bilaterally
Lumbar musculature (stretching)	Supine, knee to chest, 30 seconds/side, 2 repetitions
Abdominal muscle bracing	Supine, with knees bent, 10 repetitions
Hip flexor stretch	Lunge position, 30 seconds, 2 repetitions, bilaterally
Hamstring muscle stretch	Kneeling on one knee, opposite thigh flexed and leg fully extended with heel on the ground, 30 seconds, 2 repetitions, bilaterally
Single-leg-stand with opposite knee to chest	Standing, 30 seconds, 2 repetitions, bilaterally

[a] Patient instructed to perform exercises to tolerance without producing pain.
[b] Patient instructed to perform exercises once/day at home on days not performed during treatment visit.

Fig 2. *The self-administered traction device used in this case (Liift Device), viewed from the right side of the unit. (A) Components of the device. 1 = Device Base, 2 = Carriage Arm, 3 = Knee Bolster, 4 = Activation Arm, 5 = Handle, 6 = Center Link. (B) Patient in the neutral position. The patient lies on their back with the knees flexed around the knee bolster (3 in image A). (C) Patient in the full distraction with flexion position. The patient pulls the handle (5 in image A) to the chest, which elevates the knees and pelvis, creating distraction and flexion of the lumbar region.*

sensation. He attributed the sensation to the effects of the self-administered traction.

Following the 14 treatment sessions, a physical exam was conducted during a separate appointment. The patient had returned to normal activities without restrictions, including jogging, and had no difficulty repeatedly lifting a 40-pound weight overhead. Only 2 orthopedic tests were positive (Table 1), the shoulders were level, and all motor strength (including left hip flexion and left plantar flexion) was assessed as 5/5.

Twenty-nine months later, the patient was asked to return for a follow up examination. The patient stated he had only 2-3 brief (i.e., 1-2 day) episodes of LBP during the past 29 months, had no limitations to his activities and movements, and continued to be able to repeatedly lift a 40-pound weight overhead.

Table 1 summarizes the results of the examinations conducted at the initial visit, following 14 treatments, and at the 29-month follow-up exam. Figure 3 shows the results for pain intensity (PROMIS Form 3a) and pain interference (PROMIS Form 8a), and Figure 4 shows the results for the Oswestry Disability Index.

Discussion

The safety and efficacy of SMT and therapeutic exercise in the treatment of LBP are well established,[45-51] and current therapeutic guidelines include them as first-line treatments for LBP.[52-56] A discussion of the proposed mechanisms of these modalities is beyond the scope of this case report.

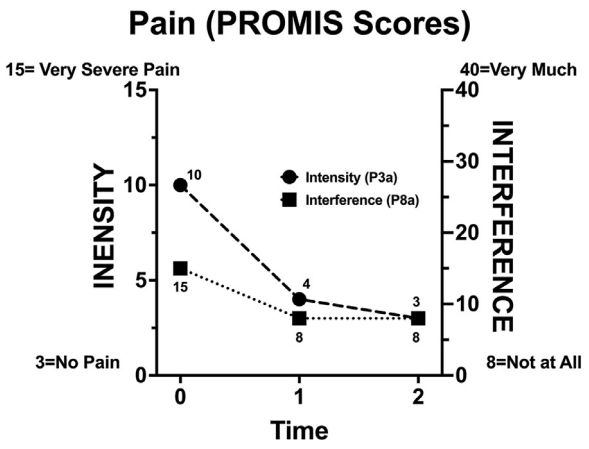

Fig 3. *Results of the pain intensity (PROMIS 3a) and pain interference (PROMIS 8a) outcomes. The scale for Pain Intensity (PROMIS 3a) is from 3 (no pain) to 15 (very severe pain). The scale for Pain Interference (PROMIS 8a) is from 8 ("Not at all" level of interference of activities due to pain) to 40 ("Very much" interference). The timepoints on the x-axis are as follows: 0 = Initial Exam, 1 = Following Care (14 Treatments), 2 = 29 Month Follow-Up.*

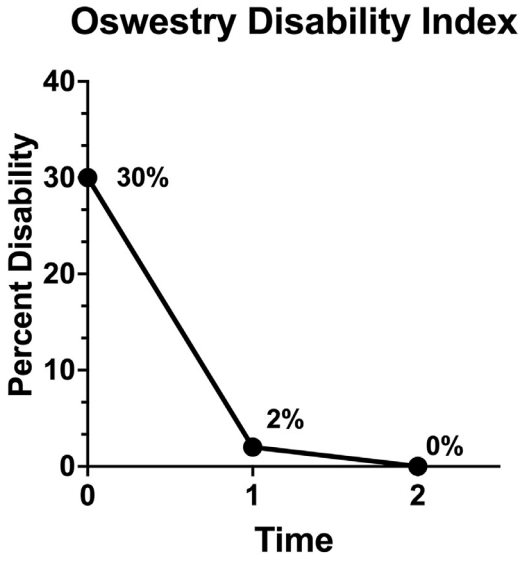

Fig 4. *Results of the Oswestry Disability Index outcomes. The scale ranges from 0% for no disability to 100% complete disability. The timepoints on the x-axis are as follows: 0 = Initial Exam, 1 = Following Care (14 Treatments), 2 = 29 Month Follow-Up.*

The unique aspect of this case was the inclusion of self-administered traction as a component of care. Clinician-administered traction[32,57,58] and clinician-administered traction combined with flexion[33-35] have been used in the treatment of LBP. However, 1 review[59] concluded that traction alone is not considered to be effective as a stand-alone treatment. This review is consistent with the multimodal care provided in this case. Use of various traction devices in the treatment of LBP that incorporate patient interaction have been reported.[60-67] However, these devices also require a clinician to properly place the patient in the unit, apply various harness/restraint devices to the patient, and adjust the harness/restraints during the treatment.[60,65-67] Many of these devices also require the patient to use their upper extremities to either pull cephalad on handles above the head[61,66,67] or push caudally on handles at about the waist level[60] with a force of 400-800N.[61] Some devices are large (the size of a hospital bed with guard rails, the entire unit tilting approximately 45 degrees),[68] rather complicated to use[62] and require more extensive therapist adjusting and/or intervention before the treatment is administered.[60,65-67] Inversion therapy can be almost completely self-administered from home. In this therapy the patient is completely or almost completely inverted in the device. Inversion therapy has been used to create traction throughout the vertebral column, including the lumbar region;[69] however, adverse events (e.g., periorbital and pharyngeal petechiae, persistent headaches, persistent blurred vision, and contact lens discomfort),[37] including rare serious adverse events (e.g., increasing intraocular pressure, spinal cord injury, death due to a brain injury, direct trauma to the head/neck) have been reported.[70] To our knowledge, the only other home traction device for the lumbar spine reported in the literature is the Vertetrac Ambulatory Lumbar Traction Device described in the text by Bergmann and Davis.[71] This device is similar to a hard lumbar brace with an upper and lower component that can be spread apart with a leverage system that creates traction. The device is fitted by a clinician, who also adjusts the tension. The patient is instructed to walk while wearing the device, initially for 15-20 minutes, and to increase the wearing time to 30 minutes once per day for 10 days. The authors provide no data supporting the use of the Vertetrac Device and we were not able to find any studies or case reports assessing the device.

The autotraction device used in this study did not require clinician help with positioning, there were no restraints involved, and the traction and flexion was fully administered by the patient with clinician supervision. Because of the mechanical design of the unit, the clinician did not need to adjust the unit in any way and minimal effort was required to create the flexion and distraction. The unit allowed the patient to limit the traction to his tolerance, which was a possible benefit.[72,73]

The proposed mechanisms of action of the self-administered device are similar to other methods of producing traction during lumbar flexion. Traction forces are proposed to inhibit spasms of the transversospinalis[74] and cause reflex inhibition and decreased muscle hypertonicity by tractioning Golgi receptors and neuromuscular spindles.[33] The traction forces may enhance imbibition of the intervertebral disc, thus increasing hydration of, and nutrition to, the disc.[75,76]

Additional proposed mechanisms of traction are related to stretching of the zygapophyseal (Z, facet) joint capsule and decompression of the Z joint during the motion produced by the traction,[77-81] which can have a pain-suppressive effect.[82-85] Opening and closing of Z joints during the flexion and traction motions is also hypothesized to reduce intra-articular adhesions, resulting in increased joint mobility.[13,86]

The patient interpreted the transient sensation felt after the second treatment as positive, and related to the self-administered traction. Two potential mechanisms are speculated for the patient's transient sensation felt after the second treatment. The first is that the flexion and traction may have augmented intervertebral disc imbibition.[75,76] A second mechanism could be related to axial stretching of the small muscles that attach adjacent vertebral segments (e.g., rotatores lumborum, interspinales and intertransversarii muscles).[74] These very small muscles may have been stretched during the prolonged axial traction and relaxation of the self-administered traction. These muscles may not normally relax sufficiently during clinician produced traction. This second potential mechanism is purely speculative. However, the success of patient managed reduction of glenohumeral dislocation, such as that accomplished using the Davos method[72,73] does indicate that enhanced muscle relaxation can occur when the patient feels s/he is in control of the traction.

Limitations and Future Research

This is a single case and the results cannot be generalized to a larger patient population. One of the authors was the patient, therefore the reporting may be biased. Although the patient attempted to be as objective as possible when reporting pain intensity and pain interference, elimination of bias due to enthusiasm with the use of a newly developed device may not have been entirely possible. In addition, SMT, therapeutic exercises, and self-administered traction were all used in this case and separating the individual contributions of each modality to the patient's outcome is not possible.

Finally, the device used in this case is categorized as an exercise device and has not yet gone through the FDA approval process. Future research of self-administered traction with flexion is needed, and additional research on the device used in this case (Liift) is necessary and must include clinical studies to assess the safety and establish the effectiveness of the device. In addition, future research

could measure the traction forces produced by the device and study its mechanisms of action.

Conclusion

The patient reported long-term benefit from a course of SMT and therapeutic exercises in conjunction with the use of novel self-administered traction with flexion.

Permission to Acknowledge

Dr. Edwin Barry, inventor and owner of the self-administered traction (Liift) device. Device loaned by Dr. Barry at no cost for the case report.

Yuri Korvatko, DC, DACBR provided radiographic interpretation.

Acknowledgments

We thank Yuri Korvatko, DC, DACBR for radiographic interpretation. We also thank Edwin Barry, DC and the Baack2 Company for loaning the self-administered traction (Liift) device at no cost for this case report.

Funding Sources and Conflicts of Interest

No funding sources or conflicts of interest were reported for this study.

Contributorship Information

Concept development (provided idea for the research): D.M., A.S., G.D.C.
Design (planned the methods to generate the results): D.M., A.S., G.D.C.
Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): D.M., A.S., G.D.C.
Data collection/processing (responsible for experiments, patient management, organization, or reporting data): D.M., A.S., T.S., G.D.C.
Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): D.M., A.S., T.S., G.D.C.
Literature search (performed the literature search): D.M., T.S.
Writing (responsible for writing a substantive part of the manuscript): D.M., A.S., T.S., G.D.C.
Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): D.M., A.S., T.S., G.D.C.

Practical Applications

- A self-administered form of traction was used with spinal manipulative therapy (SMT) and therapeutic exercises in the treatment of a case of subacute low back pain with positive outcomes.
- Supervised self-administered traction may be worth consideration in treating low back pain in conjunction with SMT.
- Further investigation of self-administered traction in clinical studies is warranted.

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