

12-1-2017

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Kyle Rasmussen
University of New England

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Rasmussen, Kyle, "The Use Of Manual Lumbar Traction And Therapeutic Exercise In The Treatment Of A Patient With Low Back Pain: A Case Report" (2017). *Case Report Papers*. 85.
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**The Use of Manual Lumbar Traction and Therapeutic Exercise in the
Treatment of a Patient with Low Back Pain: A Case Report**

Kyle R. Rasmussen, B.A.

Kyle Rasmussen, BA is a DPT student at the
University of New England, 716 Stevens Ave. Portland, ME 04103
Address all correspondence to Kyle Rasmussen at: krasmussen1@une.edu

The patient signed an informed consent allowing the use of medical information for this report and received information on the institution’s policies regarding the Health Insurance Portability and Accountability Act.

The Author acknowledges Michael Fillyaw, PT, MS for assistance with case report conceptualization as well as Megan Woodbrey, PT, DPT for assistance and supervision with the patient’s care during the clinical practicum.

25 **ABSTRACT**

26 **Background**

27 Low back pain is a common condition encountered in physical therapy practice. Manual
28 lumbar traction and therapeutic exercise are two of the most common treatments used by
29 physical therapists in the treatment of low back pain, but there is limited research investigating
30 the combined effects of these interventions on low back pain. The purpose of this case report was
31 to investigate the effects of a combined therapy approach of manual lumbar traction and
32 therapeutic exercise as part of a compressive physical therapy plan of care for treatment of low
33 back pain.

34 **Case Description**

35 The patient was a 48-year-old female with low back pain. Lifting objects, squatting, and
36 walking for long durations increased her pain. Her primary complaint was her inability to walk
37 for long durations. Her primary goals for physical therapy included decreasing pain and
38 increasing activity. Manual lumbar traction and therapeutic exercises were included in the
39 comprehensive plan of care to improve functional mobility and decrease low back pain.

40 **Outcomes**

41 The patient demonstrated improvements in pain free range of motion, manual muscle
42 testing scores, flexibility, tenderness with palpation, functional squatting, and pain levels on the
43 Numeric Pain Rating Scale. The patient also met all of the plan of care long term goals.

44 **Discussion**

45 This case study demonstrated the use of manual lumbar traction and therapeutic exercise
46 in the treatment of low back pain. Future research should emphasize generalizing results to a
47 larger population, investigating greater and different outcome measures, and determining
48 potential long term benefits of this treatment plan.

49 **ABSTRACT WORD COUNT: 252**

50 **MANUSCRIPT WORD COUNT: 2,722**

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73 **BACKGROUND and PURPOSE**

74 The Centers for Disease Control and Prevention (CDC) reported that the percentage of
75 adults ages 45-64 years that have experienced low back pain in the past three months has
76 increased from 31.3 percent in 1997 to 35.4 percent in 2015.¹ Low back pain has also been a
77 costly condition with an economic impact in the United States of over \$100 billion in total costs
78 per year.²

79 One treatment performed by physical therapists is spinal manipulative therapy (SMT). In
80 a systematic review, Rubinstein et al³ analyzed randomized controlled trials that examined the
81 effectiveness of SMT or mobilization in adults with acute low back pain. SMT was compared to
82 inert interventions, sham SMT, other interventions, and SMT as an additional therapy. The
83 results showed no difference in back pain, back pain specific functional status, and perceived
84 recovery when SMT was compared with inert interventions, sham SMT, or when SMT was
85 added to another intervention. The researchers concluded that STM should not be utilized as a
86 treatment option for low back pain.³

87 Alternatively, a randomized control trial by Balthazard et al⁴ found that SMT combined
88 with active exercise decreased low back pain. They compared patients with low back pain who
89 received spinal manipulation/mobilization in addition to active exercise (MT+AE) or detuned
90 ultrasound in addition to active exercise (ST). Immediately after completion of the manual
91 therapy treatments, the MT+AE group reported better analgesic affects as compared to the ST
92 group. Following the combined treatment, the participants in the MT+AE group presented with
93 lower scores on the Oswestry disability index and reported lower pain scores compared to the ST
94 group. The researchers concluded that manual therapy utilized in this manor was an appropriate
95 treatment of nonspecific low back pain.⁴

96 While Rubinstein et³ al concluded SMT should not be utilized as a treatment option for

97 low back pain, Balthazard et al⁴ found that SMT resulted in decreased low back pain when in
98 conjunction with active exercise as compared to exercise alone. In their randomized control trial,
99 Balthazard et al examined the SMT techniques of passive accessory intervertebral movements,
100 muscle-energy techniques, or high velocity low amplitude dynamic thrust manipulations. They
101 did not include several other SMT techniques including manual lumbar traction. Therefore, the
102 purpose of this case report is to investigate the effects of a combined therapy approach for
103 treatment of low back pain with manual lumbar traction and therapeutic exercises as a part of a
104 compressive physical therapy plan of care.

105

106 **CASE DESCRIPTION**

107 **Patient History and Systems Review**

108 The patient was a 48 year old female who worked as a library manager but was not
109 working throughout the duration of treatment. She was referred to physical therapy by her
110 orthopedic physician with a diagnosis of left sided degenerative joint disease (DJD)/degenerative
111 disc disease (DDD). X-rays of the lumbosacral region indicated disc narrowing and mild facet
112 atrophy at L5/S1. No spondylolysis or spondylolisthesis was evident. At the time of treatment
113 she was seen for both her back and knee. It was determined that the two conditions were
114 unrelated, so the focus of this case report was on the treatment intended to decrease low back
115 pain and improve related function.

116 The patient had previous chiropractic treatment for her low back pain with minimal
117 success in decreasing symptoms. She reported that anti-inflammatory drugs had decreased
118 symptoms, but were no longer doing so at the time of the evaluation.

119 The patient presented at the physical therapy clinic with signs, symptoms, and clinical
120 findings consistent with DJD and DDD. Lifting objects, squatting, walking down hill, and

121 walking for long durations were provocative of her symptoms. Her primary complaint was her
122 inability to walk for long durations. The patient reported pain in the lumbar region greater on the
123 left compared to the right. She complained of infrequent pain in her left gluteal region with
124 radiation down her left proximal posterior lower extremity. There was no other relevant past
125 medical history or any known relevant family past medical history. Her primary goals for
126 physical therapy included decreasing pain levels and increasing activity. The patient signed
127 consent to be a subject for this case report. Table 1 presents the results of the physical therapy
128 systems review.

129 **Clinical Impression 1**

130 The patient's primary problem was pain in the lumbar area. All symptoms were felt
131 greater on the left compared to the right. These symptoms inhibited her ability to maintain an
132 active lifestyle. She also was unable to lift objects, squat, or walk downhill without increased low
133 back pain which inhibited pain free activities of daily living.

134 The physical therapy diagnosis was determined to be left spine spondylosis without
135 myelopathy or radiculopathy, lumbar region. The patient's signs and symptoms were consistent
136 with this diagnosis. Spinal stenosis in the lumbar region and nucleus pulposus were considered
137 for differential diagnosis. The plan for examination was formulated to further understand the
138 patient's conditions, how her impairments related to function, and provided opportunity to
139 measure progress throughout treatment. This plan included measuring pain levels, strength, range
140 of motion, soft tissue mobility, functional mobility, and tenderness with palpation.

141 This patient was a good candidate for a case report due to limited available research on
142 the use of a combined treatment approach of manual lumbar traction and therapeutic exercise for
143 low back pain.

144

145 **Examination – Tests and Measures**

146 Range of motion, strength, tenderness to palpation, soft tissue mobility, and functional
147 mobility were analyzed during the examination to better understand the patient’s impairments,
148 function, and mobility. It was determined that the patient had full active range of motion of the
149 thoracolumbar spine but had pain with extension. Manual muscle testing for the lower extremity
150 motions at the hip and knee as well as the transverse abdominis were completed as described by
151 Kendall.⁵ Manual muscle testing techniques have demonstrated excellent interrater and intrarater
152 reliability.⁵ Tenderness to palpation was measured as described by Magee.⁶ Soft tissue mobility
153 was analyzed on an ordinal scale with values that included no restriction, slight restriction, mild
154 restriction, moderate restriction, and severe restriction. The reliability and validity of tenderness
155 to palpation and muscle flexibility were unknown but deemed appropriate as they are
156 commonplace in physical therapy practice. The patient’s squatting mechanics and posture were
157 also analyzed.

158 To better understand and quantify the patient’s pain, a straight leg test and the Numeric
159 Pain Rating Scale (NPRS)⁸ were completed. The straight leg raise test was performed as
160 described by Magee.⁶ This test was completed in the supine position to improve the test’s
161 sensitivity for a lumbar nerve root compression.⁷ The patient completed the NPRS for pain at
162 worst. The NPRS is a quick and simple self-report assessment that measures a patient’s pain
163 rating on an 11 point ordinal numeric scale. NPRS has been found to have minimal detectable
164 change values, minimal clinically important difference values, and good responsiveness.⁸

165 The objective of the completed tests and measures were to greater understand the
166 patient’s impairments and how they related to her pain and function. See Table 2 for the results
167 of the patient examination.

168

169 **Clinical Impression 2**

170 Based on the examination data collected, the signs, symptoms, and clinical findings
171 supported the diagnosis of left sided DJD/DDD provided by the referring physician. These
172 findings included increased pain with thoracolumbar extension, impaired lower extremity
173 strength, impaired transverse abdominis strength, impaired soft tissue mobility, tenderness to
174 palpation, negative straight leg raise, and 6/10 pain at worst on the NPRS. The patient continued
175 to be appropriate for the case due to her motivation to participate in skilled physical therapy,
176 severity of pain at worst, her symptoms' direct effect on ability to maintain an active lifestyle,
177 and the number of impairments. Based on the patient presentation and examination clinical
178 findings, the therapist planned to proceed with skilled physical therapy services.

179 The patient's symptoms, and clinical findings were consistent with a physical therapy
180 diagnosis of ICD-10 code M47.816 Spondylosis without myelopathy or radiculopathy, lumbar
181 region. The patient was given a good prognosis. Positive prognostic indicators for this patient
182 included motivation to participate in physical therapy interventions and motivation to return to
183 prior level of function. Also, research reports that patients with low back pain had favorable
184 outcomes with most pain and related disability resolved within weeks.⁹ Negative prognostic
185 indicators included her onset age⁹, gender⁹, and chronic nature of symptoms.

186 The plan for this patient was participation in two physical therapy sessions per week for
187 six weeks. Each treatment session lasted 45 to 60 minutes. There were no plans for referral at
188 this time. The patient's orthopedic doctor was to be consulted as needed. The treatment plan for
189 this patient included lower extremity strengthening exercises, abdominal stabilization exercises,
190 neuromuscular reeducation training, soft tissue mobilization, manual traction, range of motion
191 training, and patient education in a comprehensive home exercise program. Following the
192 evaluation and examination, short term and long term goals were established for the patient

193 (Table 3). These outcomes were to be reevaluated at 3 weeks and 6 weeks following the initial
194 evaluation.

195

196 **INTERVENTIONS**

197 **Coordination, Communication, Documentation**

198 The examination findings, proposed plan of care, and home exercise program were
199 discussed with the patient. The patient's initial examination and subsequent treatments were
200 documented utilizing an electronic medical record system. The electronic documentation was
201 available to the referring physician and was available to the patient upon request.

202 **Patient/Client related instruction**

203 At the completion of the initial examination, the physical therapist discussed how these
204 findings contributed to her condition and impairments. The patient was then educated on the role
205 of physical therapy interventions in the achievement of her treatment goals. A home exercise
206 program was also developed for the patient. Exercise demonstrations and knowledge of
207 performance feedback was provided for the home exercise program exercises. A handout was
208 provided to the patient that consisted of pictures and descriptions of each exercise which
209 included performance, duration, and repetitions. The exercises that were completed with the
210 home exercise program can be found in Table 5. The patient verbalized her understanding of the
211 examination findings, plan of care, and home exercise program.

212 **Procedural interventions**

213 Physical therapy sessions were 45 to 60 minutes in duration and were completed two
214 times per week. The therapy sessions started by asking the patient about changes in pain,
215 function, compliance with the home exercise program, or anything else pertinent to the patient.
216 The patient reported that she was compliant with the home exercise program throughout the

217 duration of treatment. The remaining time was spent performing therapeutic exercise and
218 manual therapy interventions.

219 The manual techniques utilized included muscle stretching with active movement, soft
220 tissue massage/mobilization, and manual traction. Muscle stretching with active movement was
221 performed to reduce soft tissue mobility restrictions and each stretch was held for 30 seconds
222 duration based on current literature.¹⁰ Muscle stretching was a component of the home exercise
223 program. Soft tissue massage/mobilization was used as a treatment with literature that supports
224 its inclusion in treatment for low back pathologies.^{11,12} This was discontinued after the first
225 session as the patient reported that she did not believe it was helping with her symptoms and she
226 wished to focus on other interventions. Manual lumbar traction was completed as described by
227 Kaltenborn.¹³ Manual lumbar traction was utilized to increase intervertebral space to decrease
228 low back pain symptoms and completed throughout the duration of physical therapy at each
229 session. This patient's non-involvement in manual work and no apparent fear avoidance
230 behaviors increased the probability of response with the use of lumbar traction techniques.¹⁴

231 Therapeutic exercises were selected to improve the patient's impaired transverse
232 abdominis strength, hip abduction strength, and squatting mechanics. Stationary cycling was also
233 completed because low impact aerobic exercise increases blood flow and nutrients to soft tissue
234 in the area of the spine which promotes healing.¹⁵ Exercises were completed as a part of the
235 home exercise program and during treatment sessions. The abdominal brace and abdominal
236 brace with heel slide exercises were completed on the first day of treatment as they were a part of
237 the home exercise program. The clamshell, bridging, and side step exercises were added to the
238 program on the second day of treatment. The more challenging standing hip flexion, stationary
239 bike, and standing abdominal brace exercises were added to the program on day six of treatment
240 as she progressed with improved abdominal and hip abduction strength. These exercises started

241 to replace the previous exercises that were added on days one and two and were completed as
242 tolerated. Exercises specific to each treatment session can be found in Table 4. Complete
243 descriptions and images of therapeutic exercises and muscle stretches can be found in Table 5.

244

245 **OUTCOME**

246 The patient reported decreased pain and demonstrated improved function throughout the
247 duration of care. She improved her NPRS score of 6/10 to 1/10 at worst and no longer had pain
248 with thoracolumbar extension at the time of discharge. Her gross lower extremity manual muscle
249 test scores increased to 5/5 bilaterally. Iliotibial band and piriformis flexibility improved to a
250 slight restriction bilaterally. She no longer had tenderness upon palpation along the gluteus
251 medius and piriformis bilaterally at discharge. She was also able to demonstrate a squat with
252 proper technique and full range of motion, holding for five seconds at end range, and no report of
253 increased pain. (Table 2)

254 At discharge, the patient reported increased activity without increased pain. All long term
255 goals were achieved at the time of discharge. The patient believed she could continue to manage
256 her symptoms independently by completing the exercises she learned in the clinic. She was
257 instructed to contact her physical therapist if she had any questions or concerns following
258 discharge.

259

260 **DISCUSSION**

261 This case study described the physical therapy management of a patient with low back
262 pain which included manual lumbar traction and therapeutic exercise. She reported reduced low
263 back pain and demonstrated improved functional mobility throughout the course of physical
264 therapy treatment. Factors that may have contributed positively to her outcomes included her

265 motivation, the interventions performed, her attendance of physical therapy sessions, and her
266 ability to learn. The patient also reported decreased pain immediately following manual lumbar
267 traction completed at the beginning of each session. This allowed her to complete exercises with
268 less pain and better technique which may also have contributed positively to her outcomes.
269 Factors that may have negatively affected her outcomes included her onset age⁹, gender⁹, and
270 chronic nature of symptoms.

271 The comprehensive physical therapy plan of care for this patient included manual lumbar
272 traction and therapeutic exercise. Lumbar traction is commonly used to treat low back pain to
273 increase the intervertebral space and widen the intervertebral foramina.¹⁶ Abdominal
274 strengthening exercises were also utilized for this patient. According to Chang et al,¹⁷ increasing
275 core strength can assist in supporting the lumbar spine to decrease low back pain. Low impact
276 aerobic exercise was another intervention performed by this patient. Aerobic exercise increases
277 blood flow and nutrients to soft tissue in the area of the spine which promotes healing.¹⁵ These
278 aspects of care were intended to assist the patient in decreasing low back pain and activity
279 tolerance and may have contributed to her successful outcomes.

280 The patient met all her short term goals with the exception of decreasing her pain score to
281 3/10. At three weeks of treatment, she reported 5/10 pain but she was having pain less
282 frequently. She reported having her worst pain almost daily the first week of treatment and three
283 to four times a week at the third week of treatment. She was able to meet all of her long term
284 goals which included goals for decreasing pain, improving functional mobility, and increasing
285 strength.

286 Low back pain can be a complicated condition with many factors contributing to the
287 patient's symptoms. Therefore, each patient requires a comprehensive plan of care for their
288 specific needs. A plan of care that included manual lumbar traction and therapeutic exercise

289 interventions was successful for this patient in decreasing low back pain. Future research with a
290 greater sample size is necessary to generalize results to a larger population. In addition, other
291 outcome measures could have been helpful to determine how low back pain was related to
292 function. The Oswestry Disability Index is an assessment, with excellent test retest reliability,
293 that measures disablement and how much back or leg pain impacts functional activities.¹⁸ In
294 addition, this patient had a successful outcome at the completion of treatment but further
295 research with a longer duration is needed to determine the potential long term benefits of this
296 treatment.

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313 **REFERENCES**

- 314 1. National Center for Health Statistics. Health, United States, 2016: With chartbook on
315 long-term trends in health. Centers for Disease Control and Prevention Web
316 site. <https://www.cdc.gov/nchs/data/abus/abus16.pdf>. Accessed Jul 15, 2017.
- 317 2. Crow WT, Willis DR. Estimating cost of care for patients with acute low back pain: A
318 retrospective review of patient records. *J Am Osteopath Assoc*. 2009;109(4):229-233.
319 Accessed Jul 16, 2017.
- 320 3. Rubinstein SM, Terwee CB, Assendelft WJJ, Boer, M R M de, Tulder MWv. Spinal
321 manipulative therapy for acute low-back pain (review). *Cochrane Database of Systematic*
322 *Reviews*. 2012(9):Art.No.: CD008880.
323 <http://www.narcis.nl/publication/RecordID/oai:repository.ubn.ru.nl:2066%2F109576>.
324 Accessed Jun 4, 2017. doi: 10.1002/14651858.CD008880.pub2.
- 325 4. Balthazard P, de Goumoens P, Rivier G, Demeulenaere P, Ballabeni P, Dériaz O.
326 Manual therapy followed by specific active exercises versus a placebo followed by
327 specific active exercises on the improvement of functional disability in patients with
328 chronic non specific low back pain: A randomized controlled trial. *BMC Musculoskelet*
329 *Disord*. 2012;13:162. Accessed Jul 15, 2017. doi: 10.1186/1471-2474-13-162.
- 330 5. Kendall FP, McCreary EK, Provance PG, Rodgers MM, Romani WA. Muscle testing and
331 function with posture and pain. 5th ed. Baltimore, MD: Lippincott Williams & Wilkins;
332 2005.
- 333 6. Magee DJ. Orthopedic physical assessment. 6th ed. Saint Louis: Saunders; 2014.

- 334 7. Childs JD, Piva SR, Fritz JM. Responsiveness of the numeric pain rating scale in patients
335 with low back pain. *Spine*. 2005;30(11):1331-1334. Accessed Jun 10, 2017. doi:
336 10.1097/01.brs.0000164099.92112.29
- 337 8. Oswestry low back pain scale. Spine Research Institute of San Diego Web
338 site. <http://www.srisd.com/Oswestry%20Low%20Back%20Pain%20Scale.pdf>.
- 339 9. B W Koes, M W van Tulder, S Thomas. Diagnosis and treatment of low back
340 pain. *British Medical Journal*. 2006;332(7555):1430-1434.
341 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1479671/> . Accessed Jun 25, 2017. doi:
342 10.1136/bmj.332.7555.1430.
- 343 10. Page P. Current concepts in muscle stretching for exercise and rehabilitation. *Int J Sports*
344 *Phys Ther*. 2012;7(1):109-19. Accessed Jul 9, 2017
345 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3273886/>.
- 346 11. Furlan AD, Imamura M, Dryden T, Irvin E. Massage for low-back pain. *Cochrane*
347 *Database Syst Rev*. 20015;(4):CD001929. Accessed Jul 9, 2017 doi:
348 10.1002/14651858.CD001929.pub2.
- 349 12. Branchini M, Lopopolo F, Andreoli E, et al. Fascial Manipulation for chronic aspecific
350 low back pain: a single blinded randomized controlled trial. *F1000Research*.
351 2015;4:1208. Accessed Jul 9, 2017. doi:10.12688/f1000research.6890.2.
- 352 13. Kaltenborn F. Manual mobilization of the joint volume II the spine. 12th ed. Oslo,
353 Norway: Norli; 2012.
- 354 14. Cai C, Pua YH, Lim KC. A clinical prediction rule for classifying patients with low back
355 pain who demonstrate short-term improvement with mechanical lumbar traction. *Eur*

- 356 *Spine J.* 2009;18(4):554-561. Accessed Jul 9, 2017. doi: 10.1007/s00586-009-0909-9.
- 357 15. Gordon R, Bloxham S. A systematic review of the effects of exercise and physical
358 activity on non-specific chronic low back pain. *Healthcare (Basel, Switzerland)*.
359 2016;4(2):22. <http://www.ncbi.nlm.nih.gov/pubmed/27417610>. Accessed Oct 30, 2017.
360 doi: 10.3390/healthcare4020022.
- 361 16. Pellecchia GL. Lumbar traction: A review of the literature. *The Journal of orthopaedic
362 and sports physical therapy*. 1994;20(5):262-267.
363 <http://www.ncbi.nlm.nih.gov/pubmed/7827634>. Accessed Oct 30, 2017. doi:
364 10.2519/jospt.1994.20.5.262.
- 365 17. Chang W, Lin H, Lai P. Core strength training for patients with chronic low back
366 pain. *Journal of Physical Therapy Science*. 2015;27(3):619-
367 622. <https://jlc.jst.go.jp/DN/JLC/20008185783?from=SUMMON>. Accessed Oct 30,
368 2017. doi: 10.1589/jpts.27.619.
- 369 18. Oswestry disability index. AbilityLab Web site. [https://www.sralab.org/rehabilitation-
370 measures/oswestry-disability-index](https://www.sralab.org/rehabilitation-measures/oswestry-disability-index). Accessed Oct 30, 2017.
- 371 19. HEP2go HEP for rehab pros. HEP2go Web site. Accessed Oct 31, 2017.
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380 **TABLES and FIGURES**

381 **Table 1. Systems Review**

Cardiovascular/Pulmonary	Not impaired
Musculoskeletal	<p>Impaired:</p> <p>Lower Extremity active and passive range of motion- within functional limits</p> <p>Lower Extremity Gross Strength- -4/5 to 4/5 strength bilaterally</p> <p>Abdominal strength- weak transverse abdominis</p> <p>Thoracolumbar range of motion- full range of motion and increased pain with extension</p> <p>Palpation- decreased soft tissue mobility of the bilateral piriformis, iliotibial band, and hamstrings, tenderness with palpation of the bilateral gluteus medias and piriformis</p> <p>Posture- mild right lordosis and anterior pelvic tilt</p>
Neuromuscular	<p>Impaired:</p> <p>Patient presented with sciatic neural tension symptomology despite negative straight leg raise test bilaterally.</p> <p>Lower extremity reflex/sensory integrity- intact and equal bilaterally.</p> <p>Balance- impaired standing balance in single leg stance bilaterally</p>
Integumentary	Not impaired
Communication	Not impaired
Affect, Cognition, Language, Learning Style	<p>Not Impaired:</p> <p>The patient had good affect and was alert and oriented X3. The patient did not have any observable learning or language barriers. The preferred learning style of the patient was though verbal instruction, demonstration, and pictures.</p>

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387 **Table 2. Tests and Measures**

Tests & Measures	Initial Evaluation Results		Week 3 Results		Week 6 Results	
Active Range of Motion						
Thoracolumbar	Full ROM Pain increased with extension		Full ROM No Pain with Any Motion		Full ROM No Pain with Any Motion	
Manual Muscle Testing	Left	Right	Left	Right	Left	Right
Hip Abduction	-4/5	-4/5	4/5	4/5	+4/5	+4/5
Hip Adduction	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Extension	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Flexion	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip External Rotation	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Internal Rotation	4/5	4/5	+4/5	+4/5	5/5	5/5
Knee Extension	4/5	4/5	+4/5	+4/5	5/5	5/5
Knee Flexion	4/5	4/5	+4/5	+4/5	5/5	5/5
Transverse Abdominis	-4/5		4/5		+4/5	
Flexibility Restriction	Left	Right	Left	Right	Left	Right
Piriformis	Moderate	Moderate	Mild	Mild	Slight	Slight
Iliotibial Band	Mild	Mild	Mild	Mild	Slight	Slight
Hamstrings	Moderate	Moderate	Mild	Mild	Slight	Slight
Pain with Palpation	Left	Right	Left	Right	Left	Right
Gluteus Medias Right	Grade II- Pain with Wincing	Grade II- Pain with Wincing	Grade I- Complaint of Pain	Grade I- Complaint of Pain	None	None
Piriformis Right	Grade II- Pain with Wincing	Grade II- Pain with Wincing	Grade I- Complaint of Pain	Grade I- Complaint of Pain	None	None
Squatting	Patient demonstrated squat with knees anterior to toes at end of motion and complaint of an increased lumbar pain.		Patient demonstrated squat with proper mechanics and full range of motion without an increase in pain.		Patient demonstrated squat with proper mechanics and full range of motion and able to hold for 5 seconds without an increase in pain.	
Straight Leg Raise	Negative		Negative		Negative	
Numeric Pain Rating Scale (NPRS)						
Pain at Worst	6/10		5/10		1/10	

388 **Table 3. Plan of Care Goals**

Short Term Goals: Patient to demonstrate in 3 weeks of treatment:

- 1) Low back pain will decrease to 3/10 at worst as measured by the NPRS in order to improve quality of life.
- 2) Perform a single squat with good mechanics with full range of motion without increased pain for improved daily function
- 3) Improve lower extremity strength manual muscle testing to +4/5 bilaterally.

Short Term Goals: Patient to demonstrate in 6 weeks of treatment:

- 1) Low back pain will decrease to 1/10 at worst as measured by the NPRS in order to improve quality of life.
- 2) Perform a single squat with good mechanics with full range of motion and hold for 5 seconds without increased pain for improved daily function
- 3) Improve lower extremity strength manual muscle testing to 5/5 bilaterally.

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400 **Table 4. Interventions**

	Rx Day 1- following evaluation	Rx Day 2	Rx Day 3	Rx Day 4	Rx Day 5	Rx Day 6	Rx Day 7	Rx Day 8	Rx Day 9	Rx Day 10	Rx Day 11
Intervention 1- Soft tissue massage/mobilization to the gluteus medias, piriformis, and iliotibial band	X										
Intervention 2- Manual Lumbar Traction in supine hook lying position	X	X	X	X	X	X	X	X	X	X	X
Intervention 3- Abdominal Brace	X	X	X	X	X	X	X	X			
Intervention 4- Abdominal Brace with Heel Slides	X	X	X	X	X	X					
Intervention 5- Clamshell Exercise		X	X	X	X	X	X				
Intervention 6- Bridging Exercise		X	X	X	X	X	X	X			
Intervention 7- Side Steps		X	X	X	X	X	X	X	X	X	X
Intervention 8- Standing Hip Flexion						X	X	X	X	X	X
Intervention 9- Stationary Bike						X			X	X	X
Intervention 10- Standing abdominal Brace with P-Press, One Arm Row, and Across Body Chop							X	X	X	X	X





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405 **Table 5. Therapeutic Exercises and Muscle Stretching Techniques**

Intervention	Image
<p>Abdominal Brace- Perform this exercise in supine hook lying position. Tighten abdominals as if a bowling ball were about to be dropped on abdomen. Be sure to not hold your breath. Do not tighten abdominals in a way that will change the neutral position of the spine. Complete 30 repetitions with 5 seconds holds and 2 seconds rest between each repetition. This exercise was completed as a part of the home exercise program.</p>	
<p>Abdominal Brace with Heel Slides- Perform this exercise in hook lying position. Slowly slide your heel forward on the floor/bed and then slide it back. Use your stomach muscles to keep your spine from moving out of a neutral position. Complete 3 sets of 10 repetitions. This exercise was completed as a part of the home exercise program.</p>	
<p>Clamshell Exercise- Perform this exercise with a circular band above the knees. Lay on side with the hip performing the exercise on top. Shoulders, hips, and ankles should all be aligned and remain aligned throughout exercise. Knees are bent to approximately 90 degrees and brought in front of the body. Lift top knee towards ceiling and pause before slowly returning to starting position. Complete 3 sets of 10 repetitions.</p>	
<p>Bridging Exercise- Perform exercise in hook lying position with a circular band above the knees and pull knees apart. Then tighten your lower abdominals, squeeze your buttocks, and raise your buttocks off the floor/bed as creating a "Bridge" with your body. Complete 3 sets of 10 repetitions.</p>	

Standing Abdominal Brace with P-Press-
Anchor a sport cord on the wall at chest height. Stand with an athletic squatting stance, facing perpendicular to the wall, and holding the sport cord at the center of your chest. The athletic squatting stance includes maintaining knees directly above ankles, knees bent, and upright posture. Tighten your lower abdominals and slowly push the cord straight out and back. Perform 3 sets of 10 repetitions facing each direction.



Standing Abdominal Brace with One Arm Row-
Anchor a sport cord on the wall at chest height. Tighten your abdominals and pull the sport cord straight back with one arm while in an athletic squatting stance. Maintain hips and shoulders facing the wall without rotating. Perform 3 sets of 10 repetitions with each arm.



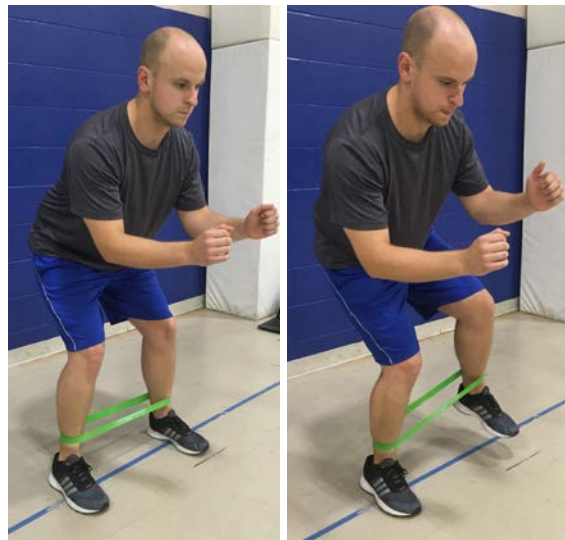
Standing Abdominal Brace with Across Body Chop-
Anchor a sport cord on the wall at your height. Tighten your abdominals and pull the cord from head height on the wall side to your hip on the opposite side while maintaining your hips and shoulders facing perpendicular to the wall. Maintain an athletic squatting position throughout the exercise. Perform 3 sets of 10 repetitions facing each direction.



Standing Hip Flexion- Anchor a sport cord to the wall at hip height. Line up perpendicular to the wall and wrap the sport cord on the leg furthest from the wall just above the knee. Slowly lift the knee to hip height without letting the band pull your knee out of alignment with your hip and slowly return your foot to the ground. Perform 3 sets of 10 repetitions facing both directions.



Side Steps- Performed this exercise with circular band above ankles. Take steps to the side while keeping your feet spread apart and toes pointed forward. Maintain an athletic squatting position throughout the exercise. Step 30 feet to the left and 30 feet to the right. Perform this 3 times.



Seated Piriformis Stretch- While sitting in a chair, cross your affected leg on top of the other as shown. Next, gently lean forward until a stretch is felt along the crossed leg. Hold the stretch for 30 seconds and 3 repetitions for each leg. This muscle stretch was completed as a part of the home exercise program.



Standing Tensor Fasciae Latae and Iliotibial Band Stretch- Stand with your side next to a wall. Place your opposite foot behind your foot closest to the wall. Use the wall for balance. Push your hips forward and away from the wall. The stretch should be felt in the side of the outside hip. Hold the stretch for 30 seconds and 3 repetitions for each side. This muscle stretch was completed as a part of the home exercise program.



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