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# Physical Therapy For Low Back Pain With A Focus On McKenzie Method For Diagnosis And Treatment: A Case Report

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2 **Department of Physical Therapy**  
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4

5 Name: Macey Berube

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39 **Physical Therapy for Low Back Pain With a Focus on McKenzie Method For**  
40 **Diagnosis and Treatment: A Case Report**

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47

48 The patient signed informed consent allowing use of medical information for this report and was

49 informed of the institution's policy regarding the Health Insurance Portability and Accountability

50 Act.

51

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60 **ABSTRACT**

61 **Background and Purpose:** Low back pain (LBP) is a common diagnosis seen in physical  
62 therapy (PT). It is thought to affect 80% of the population over their lifespan, and it keeps them  
63 out of work, affects daily activity, and decreases quality of life. PT is a noninvasive form of  
64 treatment that may include manual therapy, physical exercise, deep heat modalities, or a  
65 combination. The purpose of this case report is to review the McKenzie method combined with a  
66 conventional PT program for a patient with a recurring episode of chronic LBP.

67 **Case Description:** The patient was a 72-year-old male referred to PT by his primary care  
68 physician with a diagnosis of acute LBP without sciatica. He received PT once a week for five  
69 weeks for education on McKenzie method stretching, general stretching and strengthening, soft  
70 tissue massage, modalities, and a home exercise program.

71 **Outcomes:** Pain levels decreased from 8/10 average to 6/10 on Numeric Pain Rating Scale. The  
72 patient was able to complete full lumbar motion without pain, and had 5/5 strength of the lower  
73 extremity bilaterally. Not all objective measures were obtained due to patient self-discharge.

74 **Discussion:** LBP is a widespread diagnosis that often affects patient's quality of life. This case  
75 report demonstrated a combination of McKenzie method and conventional PT program. Results  
76 showed improvements in pain and activity levels, motion, strength, and tenderness. However,  
77 compliance with treatment may lead to increased improvements. More research into optimal  
78 McKenzie repetitions as well as compliance with this protocol would benefit future patients.

79 **Manuscript Word Count:** 3,409

80

81 **BACKGROUND and PURPOSE**

82           Low back pain (LBP) is one of the most common diagnoses seen in physical therapy  
83 (PT). It is thought that LBP affects about 80% of the world population at some point in life, and  
84 it often keeps people out of work, affects activities of daily living, and even decreases overall  
85 quality of life.<sup>1</sup> Acute, sub-acute, or chronic back pain can result from many causes, such as  
86 injury, poor posture and muscle imbalance over time, or simply degenerative disease that occurs  
87 with age.

88           Physical therapy is a noninvasive form of treatment for LBP that focuses on exercise and  
89 modalities to relieve pain. Some therapists may prefer manual therapy, many prefer the patient to  
90 exercise, and others may choose ultrasound, heat, or electrical stimulation. These are all common  
91 modes of treatment that have some evidence to support them, however, there's no way to say  
92 which one mode of treatment is best.

93           One of the treatments shown to be beneficial for many patients is the McKenzie Method,  
94 also called Mechanical Diagnosis and Therapy (MDT). This is a method of diagnosing and  
95 treating LBP that focuses on mechanical defects in the low back and treats it as a postural  
96 syndrome, a derangement, or a dysfunction, depending on how the patient presents.<sup>2</sup> A study  
97 done by Yamin et al<sup>1</sup> looked at 60 patients who had LBP over a period of 10 months and showed  
98 that the McKenzie exercise group showed a larger improvement in pain levels compared to a  
99 general conditioning group. McKenzie exercises have also been shown to increase trunk range of  
100 motion, decrease disability, and decrease pain more effectively than electrophysical agents<sup>2</sup>

101 (heat, ultrasound, and interferential current), and decrease pain while increasing motion  
102 significantly after 15 days of exercise.<sup>3</sup>

103         The purpose of this case report is to review a multifaceted approach to LBP, including a  
104 focus on the McKenzie method and paired with stretching<sup>4</sup> and strengthening<sup>5</sup> exercises, soft  
105 tissue massage,<sup>6</sup> modalities,<sup>7,8</sup> and a home exercise program<sup>9</sup> for a patient with a recurring  
106 episode of chronic LBP. Due to this patient's history and recurrent LBP episodes as well as his  
107 specific comorbidities, he does not specifically fit into other McKenzie based therapy studies,  
108 making him a good candidate for this case report.

109  
110 **CASE DESCRIPTION**

111 **Patient History and Systems Review**

112         The patient was a 72-year-old male who was referred to physical therapy (PT) by his  
113 primary care provider (PCP) with a diagnosis of bilateral acute low back pain without sciatica.  
114 He presented with an aching and sometimes sharp pain that began suddenly about a week and a  
115 half prior to initial evaluation. The patient described the location of his pain as going across his  
116 low back only and stated that it was equal bilaterally. The pain did not radiate down into his legs  
117 on either side and he denied any numbness or tingling in the lower extremities. The patient  
118 reported that the pain was worse with sitting and especially when rising from sitting, but was  
119 alleviated when he moved around or laid down. He stated that severity of back pain depended  
120 only on activity. For this specific episode of his LBP there had been no previous exercise-related  
121 treatment, as his PCP provided him with a list of low back stretches that he chose not to perform  
122 until he consulted physical therapy. The patient's only current treatment for the LBP was

123 prescribed hydrocodone that relieved his pain only partially. Upon initial evaluation, the patient  
124 gave written and verbal consent to be a part of this case study.

125         The patient's past medical history includes previous low back episodes, including one  
126 discectomy approximately twenty years ago and two separate laminectomy procedures done five  
127 and ten years ago. Other medical history includes arthritis of the cervical spine, obesity, elevated  
128 blood pressure, elevated cholesterol, and a previous bout of cancer. The patient also had a recent  
129 rotator cuff repair. His overall current rating of his health was good, and he did not have any  
130 integumentary, communication, or learning impairments (Table 1). The patient denied smoking  
131 but does drink 3-4 glasses of wine per week. He was active around his home and performed  
132 exercises a few times per week for previous injuries of other body parts. His overall chief  
133 complaint was that this bilateral LBP was keeping him from accomplishing his normal daily  
134 routine that involves yard work and working around his house. His primary goal was to decrease  
135 low back pain in order to return to his normal everyday functional activities such as yard work  
136 and housework.

137         Upon initial visit, a systems review was performed by the physical therapist, which  
138 showed impairments of the musculoskeletal system including decreased ROM, symptoms with  
139 lumbar motion, pain with palpation, and decreased strength. The review also found slight DTR  
140 impairment, as well as cardiopulmonary impairment per medical history report. No other  
141 impairments were found (Table 1).

#### 142 **Clinical Impression 1**

143         The patient presented to PT with a primary problem of acute low back pain without

144 sciatica. He initially displayed weakness and pain with hip flexion, could not perform forward  
145 flexion of the spine without pain, and walked with an antalgic gait coming into the clinic. These  
146 impairments caused this patient to have trouble with standing or sitting upright for more than just  
147 a few minutes, difficulty with walking and stairs, and made him unable to participate in leisurely  
148 activities around his home. Differential diagnoses that may have needed to be assessed were  
149 strains/sprains of low back muscles, a spondylolysis or spondylolisthesis of lumbar vertebrae, a  
150 compression fracture, an alignment issue such as scoliosis or kyphosis, a postural syndrome  
151 caused by prolonged position, a dysfunction or derangement syndrome. The plan for examination  
152 was to assess the McKenzie method<sup>10</sup> (Table 2) to determine if this pain was the result of a  
153 postural syndrome, dysfunction, or derangement. The examination was also going to involve  
154 strength testing, sensation testing, range of motion, numeric pain rating scale (NPRS), palpation  
155 of low back structures, lower extremity deep tendon reflexes (DTR), assessment of dural signs  
156 with slump test, and the modified Oswestry Disability Index.

157 This patient was a good candidate for a case report because of the commonality of LBP  
158 and the lack of evidence there was to determine the best way to evaluate and treat this diagnosis.  
159 The McKenzie method<sup>10</sup> was one that has conflicting evidence in relevance to this topic, and this  
160 patient seemed to respond to parts of this method, therefore, I wanted to further investigate the  
161 effectiveness of the McKenzie method on a patient with acute low back pain.

## 162 **Examination – Tests and Measures**

163 The first part of the examination was based on the McKenzie method or MDT, in which  
164 the symptoms monitored during movement can help classify into one of three categories.



165 According to a study done in 2005, the reliability for classifying lumbar pain related patients into  
166 one of the three categories was “ $\kappa=1.0$  with 100% agreement”.<sup>11</sup> He was asked to perform  
167 forward flexion, lateral flexion, and extension of lumbar spine (Table 2). As extension was found  
168 to change his LBP symptoms, he performed this motion in different positions to assess which  
169 position changed symptoms most. The therapist palpated the structures of the low back, where  
170 the patient was very tender. Pain was reported with palpation of the lumbar spinous processes  
171 and transverse processes of L4-L5, bilateral paraspinal muscles, and bilateral quadratus  
172 lumborum.

173 The patient received the modified Oswestry Disability Index (ODI)<sup>12</sup> to fill out before the  
174 examination. The ODI measures pain and difficulty with activity such as sleep, walking, sitting,  
175 lifting, and travel. Each question is rated on a scale 0-5, 0 being no disability and 5 representing  
176 the greatest amount of disability. The total score is divided by 50 and then multiplied by 100 to  
177 get a percentage of disability. The patient scored a 56% disability on initial exam. This outcome  
178 measure has a minimally clinically important difference (MCID) of 12.8 for patients with low  
179 back pain and excellent test-retest reliability.<sup>13</sup> This measure was the most commonly chosen  
180 outcome measure for people with low back pain in this clinic.

181 The Numeric Pain Rating Scale (NPRS) was used to measure LBP levels. The NPRS was  
182 chosen as it has excellent test-retest reliability and excellent internal consistency in patients with  
183 chronic pain.<sup>13</sup> The patient described his average LBP on the NPRS as 8/10. The patient reported  
184 that his greatest pain in the past two days had been as high as 9/10 and as low as 0/10 when he  
185 was laying down comfortably and had taken pain medication.

186           The patient also went through a series of gross manual muscle tests (MMT) for the lower  
187 extremity. This measure has excellent test-retest reliability when performed on patients with OA.  
188 Although this is not specifically related to patients with LBP, it represents reliability within the  
189 measure itself.<sup>14</sup> MMT His strength was 5/5 in lower extremity general strength areas besides the  
190 hip flexors, which were 3+/5 bilaterally (Table 2). The therapist grossly tested the patient's  
191 sensation by light touch<sup>15</sup> and no impairments were found. After sensation testing, the therapist  
192 had the patient perform a slump test,<sup>16</sup> which would indicate if the sciatic nerve may be involved,  
193 but it did not produce symptoms on either side.

194           Lastly in sitting, DTRs of the lower extremity were assessed, where the patellar reflex  
195 was found to be normal bilaterally and the Achilles reflex was found to be diminished (1+) on  
196 either side, which the patient reported was his normal response. DTR testing is known to have  
197 high inter-rater reliability when tested on the patellar tendon in healthy subjects.<sup>17</sup>

## 198 **Clinical Impression 2**

199           Based on the initial examination findings, it was confirmed that the patient represented a  
200 diagnosis of acute low back pain without sciatica that was causing activity limitation. He  
201 demonstrated high pain levels in his low back, decreased ROM and strength secondary to LBP,  
202 tenderness to palpation in low back, and a change in pain level in response to a movement based  
203 lumbar assessment. After assessing lumbar-based movements via the McKenzie method, he was  
204 classified into the derangement of lumbar spine category, since he had changes in motion and  
205 pain following repeated extension<sup>18</sup>. Due to these impairments and diagnoses, he was unable to  
206 sit or stand for long periods of time, had difficulty rising from sitting, and walked with an

207 antalgic gait pattern.

208           The patient continued to be an appropriate patient for this case study based on the results  
209 of his initial examination, his prior level of function, his motivation, and compliance with  
210 previous therapy for other issues at the same clinic. The decision was therefore made to continue  
211 with physical therapy for this patient. Based on the International Classification of Disease (ICD-  
212 10), he was assigned an ICD-10 code of M54.5<sup>19</sup>, which is described as low back pain. The PT  
213 diagnosis was determined from reason for referral as well as the results from initial examination.

214           The patient's prognosis for physical therapy was considered good. He did have some  
215 negative prognostic factors including age, previous episodes of low back pain, and  
216 comorbidities. However, he also possessed good prognostic factors that outweighed the  
217 negatives, including motivation, previous success with therapy, prior level of function, and the  
218 absence of referred symptoms down the leg.

219           The plan for intervention was to see the patient 1-2 times per week for 45-minute  
220 sessions for 6-8 weeks duration. These treatments would include therapeutic exercise including  
221 McKenzie repetitive movements to increase strength and flexibility, soft tissue massage to  
222 decrease muscular tightness and pain, modalities such as electric stimulation and ultrasound to  
223 promote healing and decrease pain, and a home exercise program. The patient would then be  
224 assessed every 10 visits with the same tests and measures used in the initial examination in order  
225 to account for any changes in function. Both short and long term goals were made to guide  
226 treatment toward functional progress (Table 3).

227 **Intervention**

228 **Coordination, Communication, and Documentation:**

229           Therapy for this patient included coordination with his primary care physician (PCP) who  
230 referred him for therapy and was sent a copy of the evaluation as well as progress notes at every  
231 10<sup>th</sup> visit. The patient was seeing a chiropractor one per week for LBP along with physical  
232 therapy, whose name and location were obtained in case any coordination with PT was needed.  
233 The physical therapist and student physical therapist coordinated and communicated care by  
234 discussing interventions for treatment and working together to provide them. A daily note was  
235 documented for each visit the patient was seen.

236 **Patient/Client Related Instruction:**

237           The patient was educated about the results of the exam, the expectations and prognosis  
238 for his diagnosis, goals for therapy, and the plan of care that was anticipated. He was also  
239 educated on the importance of posture and lumbar support when sitting. Lastly, he was taught  
240 exercises to begin a home exercise program (HEP). He was informed of the importance of the  
241 HEP, especially the McKenzie extension exercises, to control pain and make progress.

242           The patient was partially compliant with his HEP, as he admittedly did not perform the  
243 exercises as much as they were prescribed. The HEP was reviewed at each visit and any new  
244 exercises were performed to assess accuracy.

245 **Procedural Interventions:**

246           The patient was scheduled one 45-minute appointment one to two times per week for  
247 eight weeks. He attended his first five scheduled appointments, then cancelled his sixth  
248 scheduled appointment due to conflict and did not reschedule following this. The appointments

249 included McKenzie extension exercises, stretching, strengthening, manual therapy, and  
250 modalities.

251 McKenzie extension exercises were performed since he responded to repeated extension  
252 with more motion and less pain. According to Narcisa et al<sup>20</sup>, McKenzie exercises show greater  
253 improvements in the disability of patients with low back pain than back school exercises, as the  
254 McKenzie patients showed at least 20% improvement in areas of both pain and disability after  
255 therapy. The extension exercises can be done in different positions, and these positions were  
256 altered throughout treatment as progression and what best suited the patient. (Table 4)

257 Strengthening exercises were performed to increase strength and improve posture. The  
258 patient began working on extension and core strengthening exercises, such as bridging and hip  
259 extension, using a REP Theraband (Magister Corporation, 310 Sylvan Street, Chattanooga, TN  
260 37405), however, it caused him pain and was not performed continuously throughout treatment.  
261 Hip muscle strengthening was combined with lumbar stabilization because Ui-Cheol et al<sup>21</sup>  
262 showed the combination reduced lumbar disability. Stretching exercises were performed more  
263 often instead of strengthening in order to loosen the muscles that seemed to be irritated, increase  
264 motion, and manage pain. These stretches included lower trunk rotation and single knee to chest  
265 stretches. Stretching would be progressed by number of repetitions and amount of time they were  
266 held.

267 Manual therapy and modalities were used for pain management and muscle relaxation.  
268 Manual therapy included soft tissue massage that could be progressed by adding pressure and  
269 increasing time performed. The modality chosen was a combination of ultrasound (US) and

270 electrical stimulation (ES) (Chattanooga Medical Supply, 827 Intermont Rd, Chattanooga, TN  
271 37415), which the patient had responded well to in previous treatment. A 2016 study showed that  
272 ultrasound alone resulted in a significant change in pain severity, pain frequency, use of  
273 painkillers, limitation of physical activity, Schober's test<sup>22</sup>, and ODI score in 20 patients with  
274 low back pain.<sup>7</sup> Electrical stimulation is known to have analgesic effects and decreases pain  
275 perception and disability significantly more than usual low back treatment.<sup>8</sup> The two modalities  
276 combined gave the patient short-term pain relief and he preferred it to either modality alone. The  
277 parameters of the US/ES could be increased as the patient could tolerate higher voltage of  
278 electrical stimulation.

279 In addition to the interventions provided at physical therapy, the patient was also  
280 applying heat at home and using Australian Dream Back Pain Cream<sup>23</sup>.

## 281 **OUTCOME**

282 Due to poor patient compliance with the plan of care, not all objective measures were  
283 obtained after the initial examination. However, many subjective measures were gathered  
284 throughout each visit (Table 2). The patient was able to complete MMT of hip flexors with  
285 decreased pain and increased strength bilaterally. His pain levels varied throughout treatment but  
286 on average did decrease overall (Figure 1). He was also able to complete full lumbar range of  
287 motion without pain, and stand for longer periods of time without pain. The patient continued to  
288 get partial pain relief with McKenzie extension exercise in standing.

## 289 **DISCUSSION**

290 The case demonstrated its intended purpose, as the patient participated in PT that

291 included McKenzie method diagnosis and treatment combined with conventional PT treatment  
292 and results were recorded. The case appeared to be successful as there was increased ROM,  
293 decreased pain, increased strength, and decreased tenderness. The patient responded similarly to  
294 other patients who follow McKenzie method exercises, as he had centralization of pain that  
295 decreased in severity over the course of treatment. However, the patient was only seen for a total  
296 of five visits before discontinuing PT. Although he did show some positive results with retesting  
297 and responded moderately well to the plan of care, results could have demonstrated even more  
298 positive change with continued compliance with appointments and HEP.

299         The patient cancelled his sixth appointment due to conflict and reported he would  
300 reschedule. When he did not reschedule in a reasonable amount of time, the therapist phoned him  
301 and he stated that he did not want to schedule more appointments at that time as he planned to  
302 see a physician for a corticosteroid injection (CSI). Contact was made again approximately eight  
303 weeks after therapy, when he reported little to no LBP and no current need for therapy or other  
304 treatment. He did receive a prescription for a CSI, however he never had to use it, as he had  
305 been feeling so much better. This positive outcome could potentially be due to therapy, as he got  
306 the prescription not long after discontinuing therapy and never felt the need to use it. However, it  
307 can't be known whether he continued with exercises after discontinuing therapy, and he was also  
308 not very compliant with HEP while he was receiving PT. Patient did report most pain  
309 improvement from standing lumbar extension and US/ES combination. He also responded better  
310 overall to McKenzie extension exercises as compared to general conditioning such as the core  
311 stability exercises that were attempted and general stretches, which is consistent with the study

312 by Yamin et al mentioned in the background of this manuscript<sup>1</sup>.

313 All short-term goals were met, as the patient was independent with his HEP, was able to  
314 reduce pain independently with McKenzie extensions, and had full pain free lumbar range of  
315 motion. Long-term goals were never formally assessed, however, the patient did not seem to  
316 have met these based on clinical judgment. He still had high pain levels with certain activities  
317 and movements, difficulty performing sit-to-stand, and did not complete the Modified Oswestry  
318 Low Back Questionnaire before discontinuing PT.

319 As referred to in the research discussed in the background<sup>1</sup>, this patient's LBP did affect  
320 his activities of daily living, as he could not work around the yard or complete many of his  
321 ongoing projects he was used to working on. The patient did have increased trunk ROM,  
322 decrease disability by the end of therapy as he was able to participate in more activity, and some  
323 decreases in pain as described in the research by Machado et al<sup>3</sup>. However, this research was  
324 compared to electrophysical agents, which were also used in this treatment program. Future  
325 research regarding McKenzie exercise only compared to McKenzie combined with a  
326 multifaceted approach would be beneficial for future patients.

327 Research related to the importance of compliance with McKenzie exercises and their  
328 continuation at home would also be beneficial. With the patient attending fewer visits than  
329 planned and admittedly not keeping up with home program, it calls into question whether or not  
330 compliance and number of repetitions completed versus the number of repetitions prescribed  
331 affected results. Although the patient did not feel he was improving and wanted to resort to a  
332 CSI, he did report that his pain had decreased when following up by phone call. Therefore,



333 looking more into the optimal amount of repetitions per day and clinical importance of  
334 complying with this would be helpful information to be further researched. However, there is  
335 some research that shows steroid injection followed by MDT reassessment and treatment may be  
336 the best way to reduce symptoms and avoid surgery<sup>24</sup>. Considering the patient has a prescription  
337 in hand, this may be a good option for him, as well as continuing PT and McKenzie exercises  
338 following the injection.

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458 **TABLES and FIGURES**

459 Table 1. Systems Review

<b>Systems Review</b>	
<b>Cardiovascular/Pulmonary</b>	History of high blood pressure that was being controlled
<b>Musculoskeletal</b>	Impaired motion of lumbar spine Movement based lumbar tests - flexion reproduces symptoms and extension causes symptoms to lessen both during and after testing Pain with palpation L4-L5 spinous and transverse processes, bilateral quadratus lumborum, bilateral paraspinals Impaired strength – hip flexion 3+/5 with pain; all other lower extremity 5/5
<b>Neuromuscular</b>	Impaired - Achilles DTR 1+ bilaterally
<b>Integumentary</b>	Unimpaired - incision site from rotator cuff repair as well as old back surgeries all healed well
<b>Communication</b>	Unimpaired
<b>Affect, Cognition, Language, Learning Style</b>	Unimpaired

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483 Table 2. Tests & Measures

<b>Tests &amp; Measures</b>	<b>Initial Evaluation Results</b>	<b>Final Results</b>
Lower extremity gross MMT		
Hip flexors	3+/5 bilaterally with pain	4/5 bilaterally, less pain
Hip internal rotators	5/5 bilaterally	NT <sup>a</sup>
Hip external rotators	5/5 bilaterally	NT
Knee flexors	5/5 bilaterally	NT
Knee extensors	5/5 bilaterally	NT
Ankle dorsiflexion	5/5 bilaterally	NT
Ankle plantarflexion	5/5 bilaterally	NT
Gross lumbar spine range of motion		
Forward bending	NT due to pain	Mid shins, no pain
Extension	Within normal limits	NT
Right side bending	Lateral joint line of knee	NT
Left side bending	Lateral joint line of knee	NT
Palpation of lower back structures	Tender to palpation L4-L5 spinous and transverse processes, bilateral paraspinals, bilateral quadratus lumborum	Tender to palpation L4-L5 L transverse processes, L quadratus lumborum
Lower Extremity Sensation	Unimpaired bilaterally L1-S2 dermatomes	NT
Pain scale		
Current	8/10	5/10
Worst in past 48 hours	9/10	6/10
Best in past 48 hours	0/10 with pain medication	0/10 with medication or rest
Seated Slump Test	Negative bilaterally	NT



<p><b>McKenzie Movement Based lumbar tests</b>  <b>In standing:</b></p> <p><b>In lying:</b></p>	<p>-Symptoms increase during flexion, but symptoms are no worse after testing  -Symptoms decrease with extension and symptoms are better after testing  -Symptoms decrease with repeated extension and symptoms are better after testing, there was also increased motion with flexion after testing</p> <p>-Symptoms decrease with extension and symptoms are better after testing  -Symptoms decrease with repeated extension and symptoms are better after testing</p>	<p>-Symptoms continue to decrease with repeated extension and symptoms are still better after testing</p>
<p><b>Modified Oswestry Disability Index</b></p>	<p>56% disability</p>	<p>NT</p>
<p><b>DTR</b></p>	<p>Achilles 1+ bilaterally, patient claims this was normal for him</p>	<p>NT</p>

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a. NT = Not Tested

493 Table 3. Short Term and Long Term Goals

<b>Short Term Goals</b>	<b>Long Term Goals</b>
1. Independent with full HEP within 2 weeks 2. Full pain free range of motion within 2 weeks 3. Reduce symptoms independently with HEP within 4 weeks	1. High levels of pain with activity will be no higher than 3/10 within 6 weeks 2. No pain when rising from sitting to standing within 8 weeks 3. At least 1% but less than 20% impaired, limited or restricted with changing and maintaining body position according to ODI within 8 weeks

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510 Table 4. Procedural Interventions and Parameters

	Rx Day 1	Rx Day 2	Rx Day 3	Rx Day 4	Rx Day 5
McKenzie Extension Exercises	Prone press up 2 sets x 10 reps <sup>a</sup>	Prone press up x10  Prone on elbows 3 x 2 min <sup>b</sup>  Standing extension over counter x10	Prone press up 2 sets x 10 reps  Prone on elbows 3 x 2 min  Standing extension over counter x 10	Standing extension x 10  Standing extension over counter 2 sets x 10 reps	Sitting lumbar extension x10  Supine double knee to chest flexion x10  Prone on elbows 2 x 2 min
Strengthening	-	-	-	Supine bridging 2 sets x 10 reps  Standing hip extension with green TheraBand <sup>c</sup> 2 sets x 10 reps	-
Stretching	-	Supine Thomas stretch (left) 3x30 sec <sup>d</sup>	Supine Thomas stretch (left) 3x30 sec	-	Supine Thomas stretch (left) 3x30 sec  Supine lower trunk rotation stretch x10 each direction  Supine single knee to chest x30sec each side


Manual Therapy – Soft Tissue Massage	-	Moderate pressure, left Quadratus Lumborum and paraspinals, 10min	Moderate pressure, left Quadratus Lumborum and paraspinals, 10min	-	Moderate pressure, bilateral Quadratus Lumborum and paraspinals, 10min
Modalities – US/ES Combo	-	US: 3.3Hz, 1.5W/cm <sup>2</sup> , 50% duty cycle, left lumbar paraspinals  ES: 130 volts, left Quadratus Lumborum 7min	US: 3.3Hz, 1.5W/cm <sup>2</sup> , 50% duty cycle, lumbar paraspinals  ES: 155 volts, Quadratus Lumborum 7min each side	US: 3.3Hz, 1.5W/cm <sup>2</sup> , 50% duty cycle, left lumbar paraspinals  ES: 130 volts, left Quadratus Lumborum 7min	US: 1.0Hz, 1.5W/cm <sup>2</sup> , 50% duty cycle, left lumbar paraspinals  ES: 130 volts, left Quadratus Lumborum 7min

- 511 a. reps = repetitions
- 512 b. min = minutes
- 513 c. Green TheraBand = Level 3 resistance
- 514 d. sec = seconds
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533 Table 5. Home Exercise Program

Exercise	Parameters	Image
Prone Press Up	10 repetitions 2 times/day	 <p data-bbox="967 617 1279 651"><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>
Standing Extension Over Counter	10 repetitions 5 times/day	 <p data-bbox="967 1079 1279 1113"><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>
Supine Thomas Stretch	30 second hold 3 repetitions 3 times/day	 <p data-bbox="967 1528 1279 1562"><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>

<p>Bridging</p>	<p>3 sets 10 repetitions 1 time/day</p>	 <p><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>
<p>Standing Resisted Hip Extension (each side)</p>	<p>3 sets 10 repetitions 1 time/day</p>	 <p><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>
<p>Single Knee to Chest Stretch (each side)</p>	<p>30 second hold 3 repetitions 3 times/day</p>	 <p><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>

<p>Lower Trunk Rotation Stretch (each side)</p>	<p>5 second hold 10 repetitions 3 times/day</p>	 <p><a href="http://www.hep2go.com">http://www.hep2go.com</a></p>
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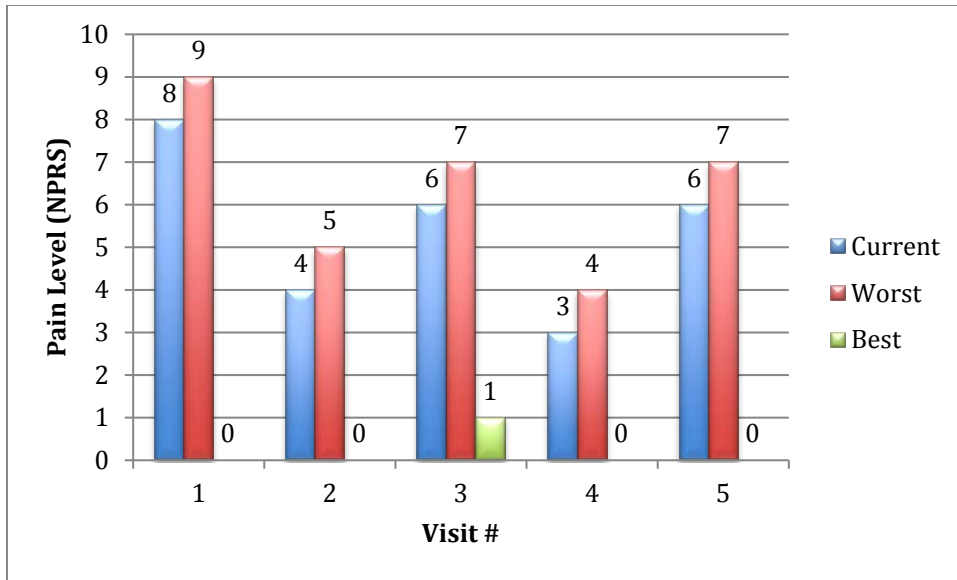
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549 Figure 1. Pain Levels According to Numeric Pain Rating Scale (NPRS) by Visit

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