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Physical Therapy Management Of A Patient With Chronic Knee Pain: A Case Report

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1 **Physical Therapy Management of a Patient with Chronic Knee Pain: A Case Report**

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11 The patient signed an informed consent allowing the use of medical information for this report and

12 received information on the institution's policies regarding the Health Insurance Portability and

13 Accountability Act.

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19 patient for compliance and participation with case report.

20 **ABSTRACT**

21 **Background and Purpose:** Knee pain affects a large number of adults, and as a result limits
22 their functional mobility and may induce participation restrictions. A number of risk factors may
23 contribute to knee pain, with osteoarthritis (OA) being the most prevalent cause. The rate of knee
24 replacement surgery among individuals 65 and older has increased significantly over the years.
25 Physical therapy (PT) is a non-surgical option that offers individuals relief of their knee pain.

26 **Case Description:** The patient was a 48-year-old Caucasian female referred to physical therapy
27 with chronic right knee pain. She received PT twice a week for eight weeks for strengthening,
28 increasing range of motion (ROM), improving stair climbing, improving gait pattern, application
29 of Kinesiotape (KT), and manual therapy to improve joint mobility.

30 **Outcomes:** Lower Extremity Functional Scale (LEFS) scores improved from 42/80 to 60/80,
31 Numeric Pain Rating Scale (NPRS) improved from 4/10 to 2/10. At the time of discharge, the
32 patient exhibited increased strength of right knee extension and flexion of 5/5, increased right
33 knee range of motion (ROM) to 115 degrees, and the ability to bend down without pain.

34 **Discussion:** Chronic knee pain can be debilitating and contribute to impaired functional mobility
35 and participation restrictions. This case report demonstrated that a combination of therapeutic
36 exercises, manual therapy, KT, and home exercise program decreased knee pain, increased
37 strength, and ROM. Limited literature is available on the long term effects smoking contributes
38 to cartilage damage among females. Further research is recommended to examine the correlation
39 between smoking and chronic pain among females.

40 **Manuscript Word Count:** 3043

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44 **BACKGROUND and PURPOSE**

45 Knee pain affects approximately 25% of adults, and as a result limits their functional
46 mobility and may induce participation restrictions. A number of risk factors may contribute to
47 chronic knee pain, with osteoarthritis (OA) being the most prevalent cause in individuals 50
48 years and older. A second contributing factor is obesity. Given the prevalence of obesity rates
49 and aging in the population, it may be anticipated that there will be an increase of individuals
50 with knee pain.¹ As a result of the increase in complaints of knee pain, individuals are choosing
51 to undergo total knee arthroplasty (TKA) surgery. According to Nguyen, Zhang, and Zhu et al.,¹
52 the rate of knee replacement surgery among individuals 65 and older increased by approximately
53 eight fold from 1979-2002.

54 Physical therapy (PT) is a non-surgical treatment that offers individuals relief of their
55 knee pain. According to Deyle, Henderson, and Matekle et al.,² a combination of manual
56 physical therapy and supervised exercise yields to functional benefits for patients with knee pain
57 attributed to OA. In addition to manual therapy and therapeutic exercises, application of kinesio
58 tape (KT) may decrease knee pain and reduce inflammation. Choo and Kim et al.,³ examined the
59 effects of kinesio taping (KT) on improving pain, range of motion (ROM), and proprioception
60 among older adults diagnosed with knee OA. The study concluded that the patients in the KT
61 group showed improvement in pain levels, ROM, and proprioception. The effects of KT on
62 proprioception were not explicitly stated.

63 The purpose of this case report is to review the physical therapy treatment and
64 management of a patient with nontraumatic knee pain. After review of the literature, it was
65 concluded that there was an array of treatment options for chronic knee pain. The case report
66 focused on implementing evidence based interventions,^{4, 13-15} such as therapeutic exercises, joint
67 mobilization, application of KT, and a home exercise program (HEP) in the patient's plan of

68 care.

69

70 **CASE DESCRIPTION**

71 **Patient History and Systems Review**

72 The patient was a 48-year-old Caucasian female referred to physical therapy with right
73 knee pain. She reported that an injury to her right knee required meniscus surgery in 2015, for
74 which she received physical therapy twice a week for six weeks. In addition, the patient's
75 medical history included two spinal surgeries, seven years apart, to remove bone spurs around
76 unspecified vertebrae levels that caused nerve compression. The patient had a history of diabetes
77 mellitus and migraines, controlled by medications (Table 1).

78 Her chief complaints were knee pain and difficulty ascending/descending stairs, walking
79 for greater than five minutes without stopping, and inability to bend down to pick something up
80 from the floor. She reported being unable to take her usual three 20 minute daily walks due to
81 her pain.

82 The goals for physical therapy were decreased right knee pain, ambulate for an extended
83 period of time without stopping, be able to bend to pick items up from the floor, and
84 ascend/descend the stairs without pain.

85 **Clinical Impression 1**

86 Based on the information from the history and system's review (Table 2), it was
87 determined the patient showed impairments of the musculoskeletal system (MS) secondary to a
88 diagnosis of right knee pain not attributed to trauma. It was hypothesized that the increased pain
89 may be the contributing factor to her impaired gait, inability to ascend/descend stairs, and
90 participation restriction. These deficits contributed to a decreased quality of life and limited
91 participation in functional activities. The patient was a good candidate for a case report because

92 of the previous knee surgery, two spinal surgeries that may have contributed to muscle
93 imbalances and nerve compression in the spine, comorbidities of diabetes mellitus and
94 migraines, and the patient's lack of physical activity. She had increased pain levels and limited
95 ROM that limited her participation and decreased quality of life. She was compliant and
96 enthusiastic to participate in PT to alleviate her symptoms. The patient read and signed consent
97 forms to participate in the case study.

98 **Examination – Tests and Measures**

99 The results of the initial examination are in Table 3. Palpation of the patient's right
100 greater trochanter did not reveal any tenderness, however palpation of the ITB in side-lying
101 elicited marked tenderness. This prompted an assessment of the patient's hip flexibility. The
102 findings revealed a negative Ober's test, therefore ruling out any ITB tightness. According to
103 Melchione and Sullivan,⁵ the original Ober's test is widely used to assess ITB tightness, however
104 it fails to provide a quantitative measurement. The validity of the Ober's test has been questioned
105 on several accounts and the reliability has not been reported. The prone knee bend test was
106 performed to rule out quadriceps tightness. A search was performed to find articles regarding the
107 validity and reliability of the prone knee bend test, however there were no articles addressing this
108 subject.

109 The patient's knee and hip strength were assessed by MMT. MMT was chosen to assess
110 strength based on the review conducted by Cuthbert and Goodheart,⁸ that review concluded the
111 literature offered a considerable amount of evidence to the reliability and validity of MMT.

112 The anterior drawer test of the knee, posterior drawer test of the knee, varus test of the
113 knee, and valgus test of the knee were performed to rule out any ligamentous injury. Palpation of
114 the lateral/medial collateral ligaments of the knee, patella, and quad tendon did not reveal any
115 tenderness.

116 At the time of the initial examination, the Numeric Pain Rating Scale (NPRS) was
117 administered to assess her level of pain. In addition, the patient rated her level of pain at its best
118 and worst. The NPRS is a useful self-report tool that measures the patient’s pain level on an 11-
119 point numeric scale, with zero indicating no pain and ten indicating the worst pain. According to
120 research by Young et al.,⁹ the NPRS has good responsiveness and construct validity.

121 The patient completed the LEFS at home. It was chosen as an easy test to administer and
122 score that provided a quantitative measurement of the functional impairment and the
123 effectiveness of the procedural interventions (PI) at the time of discharge. According to Binkley,
124 Stratford, and Lott et al.,¹⁰ the LEFS is reliable, valid, and sensitive to change.

125 The functional gait assessment was performed in the clinic on a carpeted floor. The
126 patient wore sneakers and ambulated a distance of 50 feet for four laps. The patient exhibited an
127 antalgic gait pattern with a decreased stance phase on the right. According to Krebs, Edelstein,
128 and Fishman,¹¹ observational gait analysis is a frequently used assessment tool, however it is
129 only moderately reliable in investigating kinematic gait abnormalities.

130 **Clinical Impression 2**

131 **Evaluation**

132 Based on the data obtained during the initial examination, the initial impression that the
133 patient’s MS deficits contributed to impairments in body structure and function, participation
134 restrictions, and activity limitations. She demonstrated an impaired gait pattern, decreased right
135 knee ROM, and strength. As a result, she was unable to climb stairs, walk for an extended
136 period of time, or bend down without increased pain.

137 **Diagnosis**

138 The patient’s PT diagnosis based on the International Classification of Disease – tenth

139 edition (ICD -10) was determined to be M25.561 pain in right knee and M23.91 unspecified
140 internal derangement of right knee.¹²

141 The decision was made to proceed with therapeutic exercises, manual therapy, KT, gait
142 training, HEP, and education of symptom management. The therapists determined the patient did
143 not need any referrals or consultations.

144 The patient continued to be appropriate for the case because of her MS impairments,
145 comorbidities, sedentary lifestyle, and past surgical history.

146 **Prognosis**

147 Based on the patient's past medical history, sedentary lifestyle, comorbidities, family
148 support, and motivation to return to functional activity, her prognosis was determined to be good.
149 The patient presented with comorbidities of diabetes mellitus and migraines, which were both
150 controlled by medication, and therefore not determined to be a hindrance. The patient's positive
151 prognostic factors were motivation to participate in PT, compliance with HEP, and good family
152 support. The patient's negative prognostic factors included sedentary lifestyle, previous knee
153 injury, and smoking. According to Amin, Niu, and Guermazi et al.,¹³ a longitudinal study found
154 that current smokers were more likely than nonsmokers to have articular cartilage loss in the
155 knee and thus report increased knee pain.

156 **Plan of Care**

157 The plan of care was for the patient to be seen in PT twice a week for 30-minute sessions
158 for eight to ten weeks. The program focused on strengthening the right knee, increasing ROM,
159 improving stair climbing, improving gait pattern, application of KT to help decrease
160 inflammation, and manual therapy to improve joint mobility. In addition to the exercises
161 performed at the clinic, the patient would perform a HEP twice per day on the days she was not
162 at PT. The patient would be re-evaluated periodically to measure functional improvements using

163 the LEFS, ROM measurements, MMT measurements, functional gait assessment, and NPRS.
164 Short and long-term goals were discussed with the patient (Table 4).

165 **Intervention**

166 **Coordination, Communication, and Documentation:**

167 Coordination with the patient's physician was established as a means of updating the
168 physician on the patient's progress. The physician received progress notes documenting the
169 patient's change in pain levels, ROM, strength, and gait pattern. A strong line of communication
170 was established between the student PT and supervising PT to discuss various aspects of the
171 patient's POC. Documentation was performed after each treatment session.

172 **Patient / Client Related Instructions**

173 Patient related instructions were focused on educating the patient on her ROM and
174 strength restrictions. The patient received instructions on the POC, anticipated outcomes,
175 functional goals to be achieved, and HEP. The patient was educated on the importance of being
176 compliant with the PT and HEP. In addition, the patient was educated on symptom management
177 rules and the importance of applying ice to her right knee for 15 minutes to decrease any
178 inflammation or soreness. She was compliant with her HEP, motivated to return to functional
179 activities, and compliant with her PT visits. The patient was compliant with her HEP and
180 performed them correctly. Every third PT session the patient's HEP was reviewed and updated
181 as necessary.

182 **Procedural Interventions**

183 The patient was scheduled for PT sessions twice per week for 30 minutes for a total of
184 eight weeks. The patient was informed that she may be discharged sooner if she met all of her
185 functional goals. Procedural interventions were designed with a focus on increasing strength and

186 ROM to within functional ranges. In addition, the therapeutic exercises were aimed at improving
187 the patient's gait pattern. Procedural interventions and HEP can be found in Tables 5 and 6,
188 respectively.

189 The patient was compliant with all of her PT sessions with the exception of two sessions.
190 The patient missed one session due to a timing conflict and another due to illness.

191 **Stretching**

192 Due to the patient's decreased ROM, stretching was introduced to the POC prior to
193 strengthening. The patient was instructed to perform calf stretch in standing, hamstring stretch in
194 supine, and quadriceps stretch in prone. Stretches were held for 30 seconds to ensure an
195 adequate stretch to the muscle. The stretches were also assigned to the patient's HEP to
196 maximize ROM gains. According to Aoki et al.,¹⁴ pain decreased, and gait speeds increased
197 when the stretches were held for 30 seconds. Stretches were progressed throughout the patient's
198 POC by increasing the number of times each stretch was performed within a set.

199 **Strength Training**

200 The focus of the strengthening component was to add stair exercises of various heights,
201 wall squats, terminal knee extension (TKE) with REP Theraband (Magister Corporation 310
202 Sylvan Street Chattanooga, TN 37405), leg extension, and leg curls. Through the treatment
203 sessions, the repetitions were increased prior to increasing intensity. The patient was provided
204 with a REP theraband to perform the exercises at home. All strengthening exercises were
205 introduced to the patient without any weight or resistance. Progression of resistance was based
206 on patient's feedback and tolerance. Clinical judgment and the guidelines by Kisner and Colby
207 ¹⁵ were used as a guideline for the progression of strengthening exercises.

208 Some of the methods used to progress therapeutic exercises included, increasing the
209 height of the step, increasing theraband resistance, increasing ankle weight, increasing wall squat

210 repetitions, and performing exercises while standing on right leg only.

211 **Manual Therapy**

212 As a result of the decreased ROM the patient had difficulty bending down, impaired gait
213 pattern, and difficulty ascending and descending the stairs. A non-thrust grade three posterior
214 glide in supine with the right knee in 20 degrees of flexion was performed in order to increase
215 the patient's knee flexion. According to Kaltenborn,¹⁶ both anterior and posterior glides of the
216 knee will increase knee extension and flexion, respectively. The choice to perform a non-thrust
217 grade three was chosen based on the guidelines set forth by Katlenborn,¹⁶ which stated that a
218 grade three stretch mobilization is one of the most effective means of restoring normal joint play.
219 Manual therapy was performed for approximately eight minutes at the beginning of each session
220 to promote increased range of motion.

221 **Neuromuscular Re-education:**

222 Due to the patient's presentation of increased right knee pain and inflammation it was
223 decided to tape the patient's right knee with two I-strip KT (Lumos, Inc. 1119 S. 1680 W. Orem,
224 UT 84058). KT was applied to the patient's medial and lateral borders of her right patella every
225 session. The patient was instructed to remove the KT if it caused any skin irritation. The
226 rationale behind applying KT to the patient's knee was based on suggestion from a senior PT in
227 the clinic with expertise in KT. The patient reported decreased pain and swelling to her right
228 knee after the initial application of KT. As such, KT remained a part of the POC. According to
229 Choo and Kim et al.,³ application of KT with proper tension has been shown to improve pain,
230 AROM, and proprioception in patients with knee OA.

231 **OUTCOME**

232 At the time of the initial examination, the patient exhibited MS impairments which

233 limited her participation in functional activities. Upon discharge, LEFS scores improved from
234 42/80 to 60/80. Such improvements with LEFS scores were favorable as they translated toward a
235 decreased impairment level. At initial evaluation, a score of 42/80 on the LEFS translated to a
236 47.5% level of impairment. Whereas 60/80 on the LEFS at the time of discharge translated to
237 25% impairment. A minimally clinically important difference (MCID) has been observed, a
238 MCID of nine points is typically observed when the LEFS is administered as a functional
239 outcome measure for various lower extremity impairments. NPRS improved from 4/10 to 2/10,
240 which was a long term goal that was successfully met. Increased strength of right knee extension
241 and flexion of 5/5, increased right knee ROM from 86° to 115°, right knee extension of 5°,
242 ambulate for longer than 20 minutes, and the ability to bend down without pain. Increased
243 ROM and strength were a significant improvement as they allowed the patient to ambulate and
244 climb the stairs. The application of KT was an effective intervention in decreasing edema of the
245 right knee (Table 3).

246 **DISCUSSION**

247 The patient progressed well over the course of PT as was measured by functional
248 outcome measures and clinical judgment. This case report appeared to have a successful outcome
249 as was measured by the patient's decrease in pain level, increased strength, and ROM. The
250 purpose of the case report was successfully met and the patient's goals were achieved with the
251 exception of knee extension ROM.

252 Right Knee extension was the only goal in which satisfactory improvements were not
253 achieved. A speculation as to why the knee extension goal was not successfully met may be the
254 eagerness of the student physical therapist along with limited experience. Although the SPT
255 consulted with the supervising PT regarding the patient's goals, the SPT did not take into

256 account the ROM of left knee extension and attempted to achieve zero degrees of right knee
257 extension. In retrospect, the goal for right knee extension should have been developed with the
258 intention of making the ROM symmetrical to the left knee extension. In addition, taking into
259 account the required number of degrees necessary with knee extension to be a functional
260 ambulatory.

261 The short term goals of right knee AROM of at least 100 degrees and right hip MMT of
262 at least 4/5 were both reached upon discharge. The patient's increased ROM and strength may
263 have been contributing factors in the ability to ambulate without increased pain or the urge to
264 stop. The aim of the therapeutic exercises was to achieve an increase in ROM prior to increasing
265 strength.

266 This patient had a number of positive prognostic factors, such as the willingness and
267 compliance to participate in PT, compliance with HEP, and near perfect attendance of PT
268 sessions. Although the patient had a number of comorbidities, such as diabetes mellitus and
269 migraines, they did not interfere with the POC and were not deemed an obstacle to improvement.

270 There is limited information in the literature discussing the effects of smoking on
271 articular cartilage among females.¹³ The literature, although limited examined the effects among
272 male smokers only.¹³ A number of factors may have contributed to the patient's chronic pain.
273 Such as, a sedentary lifestyle, smoking, diabetes, and increased stress.

274 With regards to this case, a combination of therapeutic exercises, manual therapy, KT,
275 and HEP demonstrated improvement for this patient's impairments and functional capabilities.
276 As measured by the LEFS and NPRS, there was demonstrated increase in function and decrease
277 in pain, respectively. Coupled with enthusiasm and compliance with the sessions and HEP, it is
278 suggested that the combination of those interventions may be beneficial to patient with chronic
279 knee pain.

280 Future research would be beneficial to examine the efficacy of KT in conjunction with
281 manual therapy and therapeutic exercises in the physical therapy management of chronic knee
282 pain. The effectiveness of KT have not been studied widely to examine if it is an effective
283 treatment to managing chronic knee pain, however studies have been conducted among
284 individuals with OA.³

285 In conclusion, patients with chronic knee pain and who do not actively engage in physical
286 activity may benefit from a combination of therapeutic exercise, KT, and manual therapy in
287 managing their knee pain and returning to functional mobility. It is imperative to take into
288 account the patient's positive and negative prognostic factors, possible comorbidities that may
289 hinder the POC, and prior level of function.

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REFERENCES

1. Nguyen US, Zhang Y, Zhu Y, Niu J, Zhan B, Fleson DT. Increasing prevalence of knee pain and symptomatic knee osteoarthritis: survey and cohort data. *Ann Intern Med.* 2011;155(11):725-732. doi: 10.7326/0003-4819-155-11-201112060-00004
2. Deyle GD, Henderson NE, Matekel RL, Ryder MG, Garber MB, Allison SC. Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee. A randomized, controlled trial. *Ann Intern Med.* 2000;132(3):173-181. doi: 10.7326/0003-4819-132-3-200002010-00028
3. Cho HY, Kim EH, Kim J, Yoon YW. Kinesio taping improves pain, range of motion, and proprioception in older patients with knee osteoarthritis. *Am J Phys Med Rehabil.* 2015;94(3):192-200. doi: 10.1097/PHM
4. Maitland ME, Ajemian SV, Suter E. Quadriceps femoris and hamstring muscle function in a person with an unstable knee. *Phys Ther.* 1999;79 (1): 66-75.
<http://ptjournal.apta.org/content/79/1/66>. Accessed May 30, 2016.
5. Melchione WE, Sullivan MS. Reliability of measurements obtained by use of an instrument designed to indirectly measure iliotibial band length. *J Orthop Sports Phys Ther.* 1993;18(3):511-5. doi: 10.2519/jospt.1993.18.3.511
6. Gajdosik RL, Bohannon RW. Clinical measurement of range of motion. Review of goniometry emphasizing reliability and validity. *Phys Ther.* 1987;67(12):1867-72.
<http://ptjournal.apta.org.une.idm.oclc.org/content/67/12/1867.long>. Accessed June 12, 2016.
7. Brosseau L, Tousignant M, Budd J, et al. Intratester and intertester reliability and criterion validity of the parallelogram and universal goniometers for active knee flexion in healthy subjects. *Physiother Res Int.* 1997;2(3):150-66. doi: 10.1002/pri.97
8. Cuthbert SC, Goodheart GJ Jr. On the reliability and validity of manual muscle testing: a

- 329 literature review. *Chiropr Osteopat.* 2007;15(4). doi: 10.1186/1746-1340-15-4
- 330 9. Young IA, Cleland JA, Michener LA, Brown C. Reliability, construct validity, and
331 responsiveness of the neck disability index, patient-specific functional scale, and numeric
332 pain rating scale in patients with cervical radiculopathy. *Am J Phys Med Rehabil.*
333 2010;89(10):831-9. doi: 10.1097/PHM.0b013e3181ec98e6.
- 334 10. Binkley JM, Stratford PW, Lott SA, Riddle DL. The lower extremity functional scale
335 (LEFS): scale development, measurement properties, and clinical application. North
336 american orthopaedic rehabilitation research network. *Phys Ther.* 1999;79(4):371-83.
337 <http://ptjournal.apta.org.une.idm.oclc.org/content/79/4/371.long>. Accessed June 12, 2016.
- 338 11. Krebs DE, Edelstein JE, Fishman S. Reliability of observational kinematic gait analysis.
339 *Phys Ther.* 1985;65(7):1027-1033.
340 <http://ptjournal.apta.org.une.idm.oclc.org/content/65/7/1027.long>. Accessed June 12, 2016.
- 341 12. <http://www.icd10data.com/ICD10CM/Codes/M00-M99/M20-M25/M25-/M25.561>.
342 Accessed June 26, 2016.
- 343 13. Amin S, Niu J, Guermazi A, et al. Cigarette smoking and the risk for cartilage loss and knee
344 pain in men with knee osteoarthritis. *Ann Rheum Dis.* 2007;66(1):18-22.
345 doi:10.1136/ard.2006.056697.
- 346 14. Aoki O, Tsmura N, Kimura A, Okuyama S, Takikawa S, Hirata S. Home stretching exercise
347 is effective for improving knee range of motion and gait in patients with knee osteoarthritis.
348 *J. Phys. Ther. Sci.* 2009;21(2):112-119. doi: <http://doi.org/10.1589/jpts21.11>
- 349 15. Kisner C, Colby L. Resistance Exercise for Impaired Muscle Performance. In: Kisner C,
350 Colby L, eds. *Therapeutic Exercise Foundations and Techniques*. Philadelphia: F.A. Davis
351 Company; 2012: 177-180.
- 352 16. Kaltenborn FM. *Manual Mobilization of the Joints, Volume I: The Extremities*. Minnesota:

353 OPTP; 2011.

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392 **Table 1. Medications**
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Medication	Frequency	Indication
Synthroid	1x/day	Hypothyroidism
Vicodin	1x/day	Pain killer
Atorovastin	1x/day	Hyper-cholesterol
Wellburtin	1x/day	Anti-depressant; Smoking cessation
Farxiga	1x/day	Type 2 Diabetes

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415 **Table 2. Results of Systems Review**
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Results of Systems Review	
Cardiovascular/Pulmonary	RHR: 80bpm, RRR: 14 breaths/minute, RBP: 130/80 mm Hg, Edema: marked edema/ swelling of right knee.
Musculoskeletal	Gross strength impairments of the right knee and hip Gross range of motion impairments of the right knee Gait deviations due to limited right knee ROM
Neuromuscular	Balance: Not impaired Gait/Locomotion: Impaired. The patient presented with an antalgic gait pattern. A functional gait analysis was performed in a hallway with carpeted floors. The patient was observed ambulating while wearing sneakers. Motor Control: Not Impaired Sensation: Not Impaired Transfers/Transitions: Not Impaired
Integumentary	Skin integrity: Normal Skin color: Normal Scar formation: No scars on the patient's right knee
Communication	Intact and appropriate
Affect, Cognition, Language, Learning Style	The patient was a 48-year old agreeable and happy female. The patient communicated in English The patient learned best with diagrams and demonstrations.

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441 **Table 3. Results of Examination**
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Tests & Measures	Initial	Final
Anterior Drawer test of the right knee	Negative	Negative
Posterior Drawer test of the right knee	Negative	Negative
Varus test of the right knee	Negative	Negative
Valgus test of the right knee	Negative	Negative
Right knee ROM	Right knee flexion: 86 ° Right knee extension: 9 °	Right knee flexion: 115 ° Right knee extension: 5 °
Right Knee strength	Flexion: 4/5 Extension: 4/5	Flexion: 5/5 Extension: 5/5
Left knee strength	Flexion: 5/5 Extension: 5/5	Flexion: 5/5 Extension: 5/5
Hip extension strength	Left: 3/5 Right: 3-/5	Left: 4+/5 Right: 4+/5
Passive straight leg raise ROM	Right: 53 ° Left: WNL	Right: 62 ° Left: WNL
Numeric Pain Rating Scale	Current: 4/10 ^a Best rating: 2/10 ^b Worst rating: 5/10 ^c	Current: 2/10 ^a Best rating: 2/10 ^b Worst rating: 4/10 ^c
Ober's test of the right hip	Negative	Negative
Prone right knee bend test	Positive	Positive
Lower Extremity Functional Scale Questionnaire	42/80	60/80

443 a = Pain at current time of filling out the Numeric Pain Rating Scale, 0-10 scale

444 b = Pain at best within the past 48 hours of filling out the Numeric Pain Rating Scale, 0- 10 scale

445 c = Pain at worst within the past 48 hours of filling out the Numeric Pain Rating Scale, 0-10 scale

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454 **Table 4. Short and Long Term Goals**

Short Term Goals (4 weeks)	Long Term Goals (8 weeks)
<ol style="list-style-type: none"><li data-bbox="240 308 808 443">1. The patient will have right knee active range of motion (AROM) of at least 100 degrees without pain for improved ambulation.<li data-bbox="240 451 808 590">2. The patient will have right hip extension MMT grade of at least 4/5 for improved ambulation and stair climbing.	<ol style="list-style-type: none"><li data-bbox="880 308 1438 443">1. The patient will be able to ambulate independently for at least ten minutes without pain by for improved functional mobility.<li data-bbox="880 451 1438 552">2. The patient will report a zero-two out of ten on the NPRS for improved functional mobility.<li data-bbox="880 560 1438 659">3. The patient will have right knee AROM extension of zero degrees without pain for improved ambulation.

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472 **Table 5. Procedural Interventions**






Intervention	Week 1	Week 2	Week 3	Week 4	Week 5
Recumbent Stationary Bike x10 minutes	Level 1 x 5 mins	Level 1 x 5 mins	Level 3 x 5 mins	Level 5 x 5 mins	Level 5 x 5 mins
Wall Squats	5 reps x 1 set	5 reps x 1 set	10 reps x 2 sets	10 reps x 2 sets	15 reps x 3 sets
Hamstring Curls	No weight x 10 reps x 1 set	1.5 pound ankle weight x 10 reps x 1 set	2 pound ankle weight x 10 reps x 1 set	3 pound ankle weight x 10 reps x 1 set	3 pound ankle weight x 10 reps x 1 set
Leg Extension	No weight x 10 reps x 1 set	1.5 pound ankle weight x 10 reps x 1 set	2 pound ankle weight x 15 reps x 2 sets	3 pound ankle weight x 15 reps x 2 sets	3 pound ankle weight x 15 reps x 3 sets
TKE with REP Theraband	Peach TB x 10 reps x 1set	Peach TB x 10 reps x 2 sets	Orange TB x 10 reps x 2 sets	Orange TB x 10 reps x 3 sets	Green TB x 10 reps x 2 sets
Calf Raises	10 reps x 1 set	10 reps x 1 set	10 reps x 1 set	10 reps x 1 set	15 reps x 1 set
Straight Leg Raise	No weight x 10 reps x 1 set	1.5 pound ankle weight x 10 reps x 1 set	2 pound ankle weight x 10 reps x 1 set	3 pound ankle weight x 10 reps x 1 set	3 pound ankle weight x 10 reps x 1 set
Quad Set	5 sec hold x 10 reps x 1 set	5 sec hold x 10 reps x 1 set	5 sec hold x 10 reps x 3 set	5 sec hold x 12 reps x 3 set	5 sec hold x 15 reps x 3 set
Short Arc Quad Set	No weight x 10 reps x 1 set	1.5 pound ankle weight x 10 reps x 2 set	2 pound ankle weight x 10 reps x 3 set	3 pound ankle weight x 10 reps x 3 set	3 pound ankle weight x 10 reps x 3 set
Hamstring Stretch	30 sec hold x 1 rep x 1 set	30 sec hold x 1 rep x 1 set	30 sec hold x 2 rep x 1 set	30 sec hold x 3 rep x 1 set	30 sec hold x 3 rep x 1 set
Quad Stretch in prone	30 sec hold x 1 rep x 1 set	30 sec hold x 1 rep x 1 set	30 sec hold x 2 rep x 1 set	30 sec hold x 3 rep x 1 set	30 sec hold x 3 rep x 1 set
Gastroc (calf) Stretch	30 sec hold x 1 rep x 1 set	30 sec hold x 1 rep x 1 set	30 sec hold x 2 rep x 1 set	30 sec hold x 3 rep x 1 set	30 sec hold x 3 rep x 1 set

473 Abbreviations: Reps, Repetitions; Sec, Seconds; TB, Theraband; Peach, level 1; Orange, level 2; Green,
 474 level 3

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477 **Table 6. Home Exercise Program**

Exercise	Parameters	Diagram
Terminal Knee Extension in Standing with REP Orange Theraband	Repetitions: 10-12 Sets: 2 Frequency: Twice/day	 <p>http://www.hep2go.com</p>
Standing Hamstring Curl	Repetitions: 10-12 Sets: 2 Frequency: Twice/day	 <p>http://www.hep2go.com</p>
Seated Leg Extension	Repetitions: 10-12 Sets: 2 Frequency: Twice/day	 <p>http://www.hep2go.com</p>
Supine Hamstring Stretch	Hold: 30 second Repetitions: 2-4 Sets: 2 Frequency: Twice/day	 <p>http://www.hep2go.com</p>
Quad Stretch in Prone with Strap	Hold: 30 second Repetitions: 2-4 Sets: 2 Frequency: Twice/day	 <p>http://www.hep2go.com</p>

478 Abbreviation: REP, Resistive Exercise Products (Magister Corporation 310 Sylvan Street

479 Chattanooga, TN 37405)

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481 **APPENDICES**

482 **Lower Extremity Functional Scale**

483

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for **each** activity.

Today, do you or would you have any difficulty at all with:

486

(Circle one number on each line)

Activities	Extreme Difficulty or Unable to Perform Activity	Quite a Bit of Difficulty	Moderate Difficulty	A Little Bit of Difficulty	No Difficulty
a. Any of your usual work, housework, or school activities.	0	1	2	3	4
b. Your usual hobbies, recreational or sporting activities.	0	1	2	3	4
c. Getting into or out of the bath.	0	1	2	3	4
d. Walking between rooms.	0	1	2	3	4
e. Putting on your shoes or socks.	0	1	2	3	4
f. Squatting.	0	1	2	3	4
g. Lifting an object, like a bag of groceries from the floor.	0	1	2	3	4
h. Performing light activities around your home.	0	1	2	3	4
i. Performing heavy activities around your home.	0	1	2	3	4
j. Getting into or out of a car.	0	1	2	3	4
k. Walking 2 blocks.	0	1	2	3	4
l. Walking a mile.	0	1	2	3	4
m. Going up or down 10 stairs (about 1 flight of stairs).	0	1	2	3	4
n. Standing for 1 hour.	0	1	2	3	4
o. Sitting for 1 hour.	0	1	2	3	4
p. Running on even ground.	0	1	2	3	4
q. Running on uneven ground.	0	1	2	3	4
r. Making sharp turns while running fast.	0	1	2	3	4
s. Hopping.	0	1	2	3	4
t. Rolling over in bed.	0	1	2	3	4
Column Totals:					

487

SCORE: ____/80

Error (single measure): ±5 scale points
 MDC: 9 scale points
 MCID: 9 scale points

489

490 ptjournal.apta.org/content/ptjournal/79/4/371/F1.large.jpg