



2009

## Use of Aquatic Therapy/Core Stabilization and a Multi-Disciplinary Treatment for a Patient with Chronic Low Back Pain: A Case Report

Jesse Elis  
*University of North Dakota*

[How does access to this work benefit you? Let us know!](#)

Follow this and additional works at: <https://commons.und.edu/pt-grad>



Part of the [Physical Therapy Commons](#)

---

### Recommended Citation

Elis, Jesse, "Use of Aquatic Therapy/Core Stabilization and a Multi-Disciplinary Treatment for a Patient with Chronic Low Back Pain: A Case Report" (2009). *Physical Therapy Scholarly Projects*. 515.  
<https://commons.und.edu/pt-grad/515>

This Scholarly Project is brought to you for free and open access by the Department of Physical Therapy at UND Scholarly Commons. It has been accepted for inclusion in Physical Therapy Scholarly Projects by an authorized administrator of UND Scholarly Commons. For more information, please contact [und.common@library.und.edu](mailto:und.common@library.und.edu).

USE OF AQUATIC THERAPY/CORE STABILIZATION AND A MULTI-  
DISCIPLINARY TREATMENT FOR A PATIENT WITH CHRONIC LOW BACK  
PAIN: A CASE REPORT

By

Jesse Elis  
Bachelor of Science in Physical Therapy  
University of North Dakota, 2007

A Scholarly Project Submitted to the Graduate Faculty  
of the Department of Physical Therapy  
School of Medicine  
University of North Dakota

In partial fulfillment of the requirement for the degree of  
Doctor of Physical Therapy  
Grand Forks, North Dakota  
May, 2009

This Scholarly Project, submitted by Jesse Elis in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

---

(Graduate School Advisor)

---

(Chairperson, Physical Therapy)

PERMISSION

Title Use of Aquatic Therapy/Core Stabilization And A Multi-disciplinary Treatment For A Patient With Chronic Low Back Pain: A Case Report

Department Physical Therapy

Degree Doctor of Physical Therapy

In presenting this Scholarly Project in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the Department of Physical Therapy shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised my work or, in his absence, by the Chairperson of the department. It is understood that any copying or publication or other use of this Scholarly Project or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and the University of North Dakota in any scholarly use which may be made of any material in this Scholarly Project.

Signature \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date \_\_\_\_\_

## TABLE OF CONTENTS

LIST OF TABLES .....	v
ACKNOWLEDGEMENTS.....	vi
ABSTRACT .....	vii
CHAPTER	
I.        BACKGROUND AND PURPOSE.....	1
II.       CASE DESCRIPTION.....	8
Examination, Evaluation and Diagnosis.....	10
Prognosis and Plan of Care.....	13
III.      INTERVENTION.....	15
IV.      OUTCOMES.....	21
V.       DISCUSSION.....	25
Reflective Practice.....	26
REFERENCES .....	29

## LIST OF TABLES

1. Initial Assessment of Trunk ROM .....	11
2. Pool Therapy .....	19-20
3. Final Assessment of Trunk ROM (Aquatic therapy).....	23
4. Final Assessment of Trunk ROM (Work Fit).....	24

## ACKNOWLEDGEMENTS

I would like to acknowledge and extend my heartfelt gratitude to the following persons who have made the completion of this case report possible:

My mother for the help and inspiration she gave to me to succeed in college.

My finance, Mickallyn, for the constant reminders and much needed support

All the UND faculty members and staff for providing me with great education

Most especially to my family and friends

And to God, who made all things possible

## ABSTRACT

**Background and Purpose:** This case report describes the use of two different conservative treatment approaches on a patient suffering from chronic nonspecific low back pain. The case report illustrates the difference between aquatic therapy/core stabilization, which focuses on the biological aspect of the injury, and multi-disciplinary treatment, which treats the injury on a biopsychosocial level. **Case description:** The patient was a 32-year old man that suffered two disc herniations from lifting a large box at work. After the injury, the patient received conservative treatments 3 months prior to this specific case report. Neurological deficits were present and the patient had positive results in multiple neural tension tests. **Intervention:** The patient completed four weeks of aquatic therapy/core stabilization and had minimal results in functional mobility and pain relief. After aquatic therapy, the patient was referred to a multidisciplinary treatment program called Work Fit, which focused on improving function through pain management. **Outcomes:** One month of Work Fit resulted in complete recovery of trunk ROM, decreased pain, improved sleeping habits, and good body mechanics with functional movement. **Discussion:** In regards to this specific patient, the multidisciplinary approach was very successful in the management of chronic back pain. The multidisciplinary program restored normal function of the patient's back through physical and psychological exercises.



## CHAPTER 1

### BACKGROUND AND PURPOSE

Despite being one of the most commonly treated injuries in outpatient physical therapy, management of mechanical low back pain is still considered a challenging disorder to treat. As noted by Brotzman,<sup>1</sup> mechanical low back pain (LBP) affects between 70% to 85% of American adults at some point in their lives and is considered the most common disability in patients younger than 40 years. With regards to the healing process, 90% of LBP patients have symptom resolution within six weeks and another 5% have symptoms resolved by 12 weeks.<sup>1</sup> Persistent back pain lasting longer than 3 months is considered a chronic injury, and the patient's prognosis of full recovery at that point begins to deteriorate.<sup>2</sup> In this specific case study, the patient suffered from two separate disc herniations and had minimal symptom relief within the first 3 months following the injury.

In general, after years of poor body mechanics the integrity of the spine begins to deteriorate and the intervertebral disc is one of the first tissues to fail. The intervertebral disc is made up of two components: the nucleus pulposus, a jelly-like material in the center, and the fibrous outer ring called the annulus fibrosis.<sup>2-3</sup> A herniation occurs when the collagen fibers of the annulus fibrosis are unable to resist the unbalanced radial pressure of the nucleus pulposus. The posterolateral aspect of the disc is the weakest point and concurrent movements of flexion and rotation result in excessive stress to the

weak area. With the accumulation of pressure in the posterior disc, the nucleus pulposus begins to push through the distal annular fibers until it's exposed within the spinal canal. Pain is a result from either the direct pressure of the disc lesion on the adjacent nerve root or the inflammatory mediators that attack the foreign disc material and irritate the nerve root. Nerve root irritation causes symptoms such as edema, warmth, redness, muscle weakness, pain, and paresthesia within the nerve root sensory distribution.

When dealing with treatment options for a herniated nucleus pulposus, there are two different approaches: surgical and non surgical (conservative) approach. The most common surgical option is a lumbar discectomy, in which the exposed disc material and any additional bone impinging on the nerve root is removed.<sup>4</sup> In regards to conservative treatment, there are a variety of options; such as physical therapy, chiropractic, and pharmaceutical agents (muscle relaxants, steroids, epidural injections). In general, conservative management includes maneuvers to reduce pressure on the nerve root and attempt to pull the exposed disc material back into the central disc space. One systematic review compared a surgical and a conservative approach in the treatment of degenerative disc disease, with the results showing surgery to be the superior choice compared to an unstructured conservative treatment; however a highly structured rehabilitation program with a cognitive-behavioral approach produced results similar to surgery.<sup>5</sup> In addition, another article found there was no clear evidence that a spinal fusion was superior to an intensive rehabilitation approach and the long term effects showed no differences.<sup>6</sup>

Conservative treatment is always the more conventional option in treating injuries and the primary healthcare provider needs to determine which choice would be most

beneficial to the patient. The two treatments being assessed here are a combined rehabilitation program of aquatic therapy/core stabilization and a multidisciplinary approach. The reason for aquatic therapy/core stabilization was to attempt to reduce the disc lesion in a gravity-free environment. Shoulder depth water can decrease the body weight by 90% and deliver pain relief to the impaired disc.<sup>7</sup> In addition, the water environment provides 12 times higher resistive force than air resistance, which generates a challenging compensatory exercise program compared to dry land exercises.<sup>7</sup> With hyperactive muscles, the water provides a soothing effect on spastic muscles. According to a study done by Barone and Gangaway,<sup>8</sup> aquatic therapy allows low back patients to begin exercises earlier and have a shorter rehabilitation process.

Multidisciplinary treatment programs are a new option for low back pain but in regards to evidence-based research it's quite limited. The programs require substantial staff and financial resources to cover the indirect costs that burden employers, insurance companies, and the patients as well.<sup>7</sup> One study by Sieben et al,<sup>9</sup> researched the difference in treatment orientation by the involved physician and how they approached the injury at a psychological level. The results showed an association between pain-related fear and restrictive advice from the physician, demonstrating the importance of physicians' optimism when educating the patient.<sup>9</sup> Another cross-sectional study, measured the EMG results of maximal isometric trunk exertions between two groups: participants with high versus low pain related fear. Participants with high pain related fear had significant smaller peak force for flexion and right and left side bends, accentuating the negative effects that pain-related fear has on functional activities.<sup>10</sup>

With concerns to the multidisciplinary approach to back injuries, the established program in this current study was called Work Fit and the conceptual basis for this type of rehabilitation lies in the biopsychosocial model of pain. The patient's referral into the program was based on the chronicity of the injury and the program's specialty in pain management.

Work Fit is made of a fundamental medical team consisting of a physician, pharmacist, physical therapist, occupational therapist, psychologist and the patient's employer. The main objective for Work Fit is to regain 30% to 45% improvement in functional work-related physical capacities. At discharge, the patient should have current work-related capacities, independence in symptom management, understanding of safe work environment concepts, and continued independence in a home exercise program (HEP). The program's interventions consist of: stretching, functional strengthening, aquatic therapy, education on correct posture and body mechanics, hypnosis, stress management, and comprehensive sleep classes. In a current study of the multi-disciplinary approach, the results showed positive outcomes with regards to returning to work, sick leaves, and subjective disability interpretations.<sup>11</sup>

The purpose of this case report is to provide an in-depth view on how to treat a patient suffering from chronic mechanical lumbar pain. This specific patient completed two different rehabilitative treatments and the research will show that in certain situations one option is superior to the other. Initially, the patient completed aquatic therapy and core stabilization exercises, after which the plan of care transitioned into the multidisciplinary approach. Aquatic therapy/core stabilization can address the

physiological aspect by attempting to reduce the herniation, but since the injury is a chronic issue there are additional aspects involved. Once the injury has progressed to being a chronic issue, medical practitioners need to unravel the degrading psychological views the patient has constructed due to the back pain. Avoidance issues are created by the negative stimuli that are present with movement and the patient begins to fear active trunk movement.<sup>8,9</sup> The following case study illustrates how this thinking influences the established treatment approach to chronic low back pain.

## CHAPTER II

### CASE DESCRIPTION

The subject in this case report was an obese 32-year-old male who injured his lower back while moving boxes at work. He was bent forward and twisted as he attempted to lift a box and felt a distinguishable “popping” sensation located in the lower back. The next day, he reported feeling pain centralized in the low back and muscle spasms along the right lumbar paraspinals. Two days later, he reported having intermittent impaired sensation in the lumbar region and right buttock. Previous management for the patient’s episode of LBP included two weeks of physical therapy and a few visits to the chiropractor. These treatments occurred three months prior to our treatment and had minimal effect on improving his back function. His employment position was a stocker at a local department store and he admitted sustaining multiple back injuries within his 9-month work span. In addition, the patient reported he wasn’t satisfied and had lost motivation with his current employment. Other than the back injuries, the patient’s past medical history was unremarkable. Deprivation of sleep due to back and leg pain was his chief complaint and he had difficulty finding any position of relief. He reported having a poor sleep cycle and on average had four hours of undisturbed sleep per night. In attempting to sleep, he found his pain subsided temporarily when lying prone with pillows propped up to establish some slight back extension.

The patient reported constant pain around his lower back with the highest level of discomfort occurring in the morning. The average intensity of his symptoms was 6 to 8 on a verbal pain scale ranging from 0 to 10, with the score of 0 describing no present pain and a rating of 10 describing the worst pain imaginable.<sup>12</sup> He reported having a decrease in pain when he kept active and ambulated short distances. The back pain seemed to flair up with prolonged sitting, lifting objects, and flexing the trunk forward. In addition to the stated conservative treatments, the patient reported taking NSAIDs for pain relief and Flexeril® to control his back spasms.

Completing the Short-Form 36 health survey also assessed the patient's psychological status, and the results for his mental summary score was 26.1, which was below the standardized average of 50.<sup>13</sup> He reported feeling slightly depressed and reported minimal interaction with his family because of the back pain. His family consisted of his wife and nine-year old daughter, and he expressed the inability to work caused an economical burden. He also described having a very low activity level prior to his back injury and that he smoked on average 20 cigarettes per day.

Failed attempts of dry land exercises created a great opportunity for aquatic therapy. A new environment could result in positive motivation to regain function. Due to failed prior attempts and his depressive state, the patient needed motivation to uphold compliance. Furthermore, there have been good results using multidisciplinary treatment for chronic back pain.<sup>10</sup> My clinical preference is shifted towards these two approaches because the patient is motivated to get better. The pool setting will be a pleasant environment to initiate trunk motion and regain lost function. If the aquatic therapy fails,

the multi-disciplinary treatment will uncover negative emotions and educate in pain management.

### Examination, Evaluation, and Diagnosis

The initial physical therapy examination occurred approximately 3 months post injury and the patient reported his back symptoms were progressively getting worse. Upon observation, the patient presented with a forward head, rounded shoulders, and slumped posture secondary to back pain. During the evaluation process, the patient was unable to sit in a chair for greater than 10 minutes without needing to stand up and reposition for pain relief. He demonstrated an antalgic gait pattern with forward slumping and had problems with transitional movements.

Range of motion was measured by a deficit percentage and all motions were limited with an empty end feel (see Table 1 for ROM measurements). All ROM measurements were completed by using techniques taken from *Measurement of Joint Motion: A Guide to Goniometry*.<sup>14</sup> Standing extension had a 25% loss, with hypomobility found at the right L2-3 facet joint. The patient shifted away from left side bending and when he attempted to actively side bend to his left he compensated with forward flexion. Left side bending was attempted a second time but with physical therapist generated forces to minimize the compensation but was stopped at neutral because of back pain. Significant limitations in ROM were also found in both hips; primarily from tight hamstrings, piriformis, iliopsoas, and rectus femoris, but no goniometric measurements were taken of the lower extremities.



Table 1. Initial Assessment of Trunk ROM		
Trunk Motion	% of Deficit	Endfeel
Flexion	50%	Empty
Extension	25%	Empty
Right Sidebending	Deferred due to pain	Not assessed
Left Sidebending	25%	Empty
Right Rotation	50%	Empty
Left Rotation	50%	Empty

The patient's strength was assessed by resisted isometrics but the patient refused trunk testing due to flaring of symptoms. Lower extremity testing was done in sitting and found the musculature to be within normal limits (5/5), with pain present with right hip flexion and extension and with ankle dorsiflexion. Manual muscle testing was assessed according to Reese.<sup>15</sup> The pain described during the lower extremity testing was located in the low back and posterior thigh of the right lower extremity. He exhibited poor inner core strength and was measured at 3+/5. Active control of the inner core was measured by having the patient lie in supine and contract the core while keeping the low back in contact with the plinth. Palpation of the transversus abdominis during the isometric hold confirmed shakiness and within 10 seconds displayed signs of fatigue.

Palpation revealed hypertonicity along the lumbar paraspinals with the right side being greater than the left, primarily in the location of L2 -5. Pocket edema was present

around L3-S1 and light touch on the inflamed area resulted in radiculopathy of the right leg. Hypertonicity to the right piriformis was also discovered from the assessment. Grade II posterior-anterior glides on L4-5 were attempted to assess joint play but were deferred due to back pain. Deep tendon reflexes, specifically L3 and S1 nerve roots, were also assessed and graded as symmetrically normal. Dermatomes were assessed and appeared normal, but the patient reported intermittent paresthesia in the right buttock with prolonged sitting.

Special tests were also completed to determine if the injury was musculoskeletally or neurologically-based. The modified slump test increased symptoms and was positive bilaterally. Symptoms fluctuated with the position of the head and ankle, in that when the head was placed in flexion or the ankle was moved into dorsiflexion, there was an increase in pain.<sup>16</sup> When the physical therapist modified the head/ankle position by placing the head in neutral, it reinforced the involvement of neural tissue and ruled out musculoskeletal involvement. Right prone knee bend test also caused discomfort, producing positive neurological results. The test is completed by having the patient lie in prone and flexing the knee towards the patient's buttock. Although this positive neurological sign would indicate impaired sensation located around the low back, the test has showed only moderate levels of intrarater (.52) and interrater (.46) reliability.<sup>17</sup> When assessing neural involvement with the straight leg raise test, there were positive results bilaterally for dural mobility irritation. In a study by Rabin<sup>16</sup>, he describes the SLR test by flexing the hip to 90 degrees while maintaining the knee in extension. Once the maneuver reproduces symptoms the examiner flexes the knee while maintaining the

hip position, and then the patient is asked to report a change in symptoms. The article also found the SLR test had a greater sensitivity (.64) compared to the slump test (.41) and was the superior test for ruling out disc herniations.<sup>16</sup> The positive results from the multiple dural mobility tests concluded the injury had affected neural tissue in the lower back. Several sacral stress tests: Gillet's test, sacral compression, and gapping test, were completed with their results ruling out a sacroiliac dysfunction.

According to the *Guide to Physical Therapist Practice*,<sup>18</sup> the patient's diagnosis was documented as 4F: 722.7. Initially, the physician diagnosed the injury as a right lumbar strain. After week 3 of physical therapy, the patient had a MRI on his spine and the imaging found a moderate left L4-5 central-lateral extrusion and a small left posterolateral L5-S1 protrusion. After the imaging showed signs of disc lesions, the physician's diagnosis was changed to a herniated nucleus pulposus, which correlated with the PT diagnosis.

There were many problems with this patient, with the complete list of impairments and functional limitations as follows; loss of trunk ROM, sleep deprivation, pain and inflammation, hypertonicity of back extensors (specifically multifidus), inability to sit for greater than ten minutes secondary to pain, poor gait pattern and difficulty with transitional movements, decreased involvement with family, inability to work, and poor awareness of posture and body mechanics.

#### Prognosis and Plan of Care

Evidence of determining the prognosis of chronic mechanical low back pain is quite unpredictable due to the many factors that are involved with the condition. Chronic

back pain not only causes physical pain, but some patients who complain of somatic pain are really conveying anxiety and depression from the impairment. As noted in a study by Dionne,<sup>19</sup> there are seven established variables that affect the time frame of returning back to work: patient's recovery expectations, radiating pain, previous back surgery, pain intensity, frequent change of position in response to back pain, irritability and bad temper, and difficulty sleeping. In addition, heavy smoking has been linked to poor healing rates and nicotine can cause hypersensitivity to pain receptors.<sup>20</sup> Many of the variables coincided with this specific patient and could prove to worsen the prognosis. The expected prognosis was set at 4 weeks of aquatic therapy and core stabilization.

The initial choice for the plan of care was to establish an aquatic therapy program with core stabilization. The expected goals for the patient were to improve sleeping duration to 8 to 10 hours without discomfort, regain full pain-free trunk motion, decrease inflammation, demonstrate good body mechanics and posture, improve gait pattern and transitional movements, and the ability to sit pain-free for over three hours. Re-examination of trunk ROM, subjective pain rating, sleep duration, and neurological special tests were the main factors throughout the treatment in determining the progression and status of the impairment.

In regards to the initial impression, there is still potential for the patient to recover his function. There are some negative prognostic factors involved, but the pool setting may result in better compliance to physical therapy. If that option fails, then Work Fit will shift treatment to focus on pain management and decrease pain-related fear.

## CHAPTER III

### INTERVENTIONS

Initially, the patient's established plan of care was aquatic therapy and core stabilization. The main objective to the program was to minimize the disc lesion through core stabilization and trunk exercises. The physician's rationale for referral to pool therapy was because of the gravity-free environment to initiate quality trunk movement. Other reasons for choosing aquatic therapy/core stabilization were (1) reducing skeletal muscle tone and pain, (2) decreasing joint compressive forces, (3) increasing buoyancy promotes spinal and peripheral joint ROM, (4) varying the degrees of difficulty of exercises, (5) reducing anxiety and increasing feelings of well-being, and (6) being cost-effective in direct staff time.<sup>21</sup> The aquatic treatment program that the patient received consisted of exercises and activities found in Table 2. Pool exercises were progressed when the patient demonstrated correct and pain-free form. Correct posture, sustained core stability, and body mechanics were emphasized throughout each PT session and for the home exercise program. The home exercise program was quite limited because the treatment was pool-based; however the patient was instructed to perform 5 repetitions of 30 to 45 second isometric holds of the transversus abdominis for every hour awake. Part of the training is to avoid contracting the global abdominal muscles and instead focusing on the deep transversus abdominis (TA).<sup>22</sup> Initially, the preferred position for the exercise was in hooklying but as the patient advanced he was able to progress to sitting

and standing positions. Dynamic limb movement in conjunction with a contracted TA muscle has been shown to increase paraspinal hypertrophy.<sup>22</sup>

Patient education was very important and focused on good lifting techniques, sitting posture, avoidance of trunk flexion, and sleeping techniques. His family members also modified their lifestyles by assuming the majority of the household chores to allow the patient's back sufficient time to heal. Proper cryotherapy techniques were also administered to decrease the localized swelling in his lower back. The patient was instructed to apply an ice pack on his low back 4 times per day for a duration of 20 minutes. One of the primary reasons for inclusion of cryotherapy was because of the analgesic effects it produced by reducing the nerve conduction velocity.<sup>23</sup>

After four weeks of ineffectiveness, PT treatment shifted from aquatic therapy to a multidisciplinary approach. The structured multidisciplinary program, Work Fit, specialized in managing the back injury at a biopsychosocial level. The rationale in switching treatment programs was due to the plateau of results with aquatic therapy and emphasis of work conditioning with the new program. A systematic review by Guzman<sup>24</sup> noted that an intensive multidisciplinary rehabilitation consisting of bio-psycho-social qualities was more successful in recovering function compared to inpatient or outpatient non-multidisciplinary treatment.

As described earlier, the program consisted of a wide variety of components: generalized stretching, pool therapy, proper body mechanics, sleep psychology, generalized lifting program, and biofeedback in desensitizing the injury. Each day of the program began with 30 minutes of stretching and focused on regaining motion of lower

extremities and trunk musculature. A systematic review by Weldon<sup>25</sup> found four articles supporting the importance of including stretching techniques to exercises-related injuries, especially on a preventative basis. Pool therapy used the same exercises and principles as the prior PT treatment. The generalized strengthening program consisted of leg press, leg curls, leg extension, squats, seated rows, lat pulldowns, and chest press. All the exercises were adjusted at three sets of 15 repetitions or until fatigue. Aerobic conditioning was walking on a treadmill until fatigue set in and the main goal was to reach 30 minutes of walking at a speed of 2 to 3 miles per hour. In addition, the patient attended a 45-minute lifting class and worked on proper lifting body mechanics. A systematic review by Lewis et al<sup>26</sup> evaluated the significance of treating chronic low back pain with physical therapy that consisted of general strengthening, aerobic fitness, and a flexibility regime compared to other conservative treatments. The results showed the physical therapy treatment was effective in reducing back pain but there was no consensus on a specific exercise format that was superior to other conservative treatments.<sup>26</sup> Besides physical activities, the patient attended psychological counseling to learn techniques in stress management. Sleeping class helped the patient improve his sleep cycle with different positions and guidelines. Biofeedback was also used to re-educate the patient in pain management and focused on desensitizing his back symptoms. A systematic review by Morley et al,<sup>27</sup> found that cognitive behavioral treatment that included biofeedback produced significant changes in measures of pain experience, mood/affect, pain behavior, activity level, social role function, and cognitive coping and appraisal.

Physical therapy was not the only discipline included in the plan of care. The physician, pharmacist, occupational therapist, psychologist, and patient's employer were all involved in the multidisciplinary approach. Weekly meetings were completed every Thursday to assess the patient's status and to modify any areas of the plan of care which needed to be updated.

Some intervention options were not included in the plan of care. Dry land extension exercises, such as the McKenzie approach, were not done because of the poor results from past PT treatments. In addition, manual therapy was avoided because it resulted in peripheralization of symptoms and increased pain. Heat modalities were also excluded because the state of the back injury still showed signs of inflammation.



**Table 2. Pool Therapy**

<b>Week</b>	<b>Treatment</b>	<b>Reps</b>	<b>Rationale</b>	<b>Outcomes</b>
<b>1</b>	- Ambulating laps (forward/backwards)	1 x 3 laps	- Initiate movement and regain flexibility, gait training	- Improved gait sequence without slumped posture
	- Standing straight leg raise (neutral, 60 <sup>0</sup> , 180 <sup>0</sup> )	1 x 10	-Increase LE ROM, neural mobilization	- Pain began to centralize in the low back
	- Mini-squats	1 x 10	- Controlled movement with tight core, postural education	-Initiated gross movement and improved body mechanics
	- Deep water traction w/ 10 lb ankle weights	15 min	- Pressure relief of lumbar discs	- Best option for pain relief - lowered it to 3/10
	-Bilateral UE symmetrical PNF pattern	1 x 10	- Promote trunk mobility, increase lumbar lordosis	- Slight pain when extending back
	- Sustained standing back extension	3 min	- Reduce herniation by increasing lumbar lordosis	- Symptoms remained constant: no change
<b>2</b>	-Ambulating laps (forward, backwards, and sidestepping)	1 x 3 laps		- Improved gait sequence
	- Standing SLR (neutral, 60 <sup>0</sup> , 180 <sup>0</sup> )	1 x 20		- No changes from week 1
	- Mini-squats	3 x 10		- No changes of symptoms
	- Deep water traction w/ 10 lb ankle weight	15 min		- Centralized symptoms and lowered the pain to 3/10
	-Bilateral UE symmetrical PNF pattern	1 x 10		- Improvement w/ sustained upright posture
	- Sustained standing back extension	3 min		- Aggravated back symptoms
	- Standing back extension with patient overpressure	1 x 20	- Reduce herniation with increased external forces	- Increased trunk extension ROM (15%)
<b>3</b>	-Ambulating laps (forward, backwards, and sidestepping)	1 x 4 laps		- No changes from week 2
	- Standing SLR (neutral, 60 <sup>0</sup> , 180 <sup>0</sup> )	1 x 25		- No changes
	- Mini-squats	3 x 10		- Increased pain when coming up from squat
	- Deep water traction w/ 10 lb ankle weight	15 min		- Centralized pain into low back (4/10)
	-Bilateral UE symmetrical PNF pattern	1 x 15		- Pain with extension
	- Standing back extension with patient overpressure	1 x 20		- Pinching pain occurred with overpressure
	- Grade II PA mobilizations	5 min	- Mobilize joints for pain relief	- Perpheralization of symptoms into (R) buttock
	- Deep water cycling	10 min	- Promote healing through movement	- No changes w/ symptoms

**Table 2. Pool Therapy (cont)**

Week	Treatment	Reps	Rationale	Outcomes
<b>4</b>	-Ambulating laps (forward, backwards, and sidestepping)	1 x 4 laps		- Upright posture but no pain relief
	- Standing SLR (neutral, 60 <sup>0</sup> , 180 <sup>0</sup> )	1 x 20		- Pain @ 7/10 with neutral SLR
	- Mini-squats	3 x 10		- No changes from week 3
	- Deep water traction w/ 10 lb ankle weight	15 min		- Minimal pain relief (5/10)
	-Bilateral UE symmetrical PNF pattern	1 x 10		- No changes
	- Deep water cycling	10 min		- No changes w/ symptoms
	-Single leg squats w/ 5 lb ankle weights	2 x 10	- Controlled core stabilization w/ movement	- No changes w/ symptoms
	- Shoulder retraction with water paddles	1 x 15	- Postural education	- Improved sitting posture

## CHAPTER IV

### OUTCOMES

Initially, the patient attended aquatic therapy/core stabilization three times per week in a span of four weeks, which totaled eleven 30-minute sessions. Outcomes were primarily measured by the visual pain diagram, verbal pain scale, myotomes, dermatomes, trunk ROM, gait sequence, straight leg raise, and risk reduction techniques. Uninterrupted sleep cycle and prolonged sitting were also documented to assess the progression of the PT treatment. Outcome measurements for aquatic therapy/core stabilization can be found in Table 2. The SF-36 was not used to measure the outcomes of treatment because the assessment was only completed on the initial visit. With regards to the initial visit, the patient received instructions on good body mechanics, postural education, and supine core stabilization exercises. When he returned for his second visit, the patient demonstrated improved sitting posture and minimal slouching in his gait sequence. After the initial visit, the intervention was done in the pool as described earlier. After the first week of aquatic therapy, the patient reported having more trunk flexibility for transfers and an improved upright posture when ambulating. The patient reported an improved sleep cycle and averaged 5 hours of undistributed sleep. Deep water traction provided back pain relief and the patient reported his pain level was at a 3/10. Standing extension with overpressure increased the pain level to 8/10. The patient also independently demonstrated the prescribed supine core exercises and good body

mechanics with transitional movements. The patient reported increased pain (8/10) when moving into standing extension.

The second week outcomes showed improved trunk extension (15% deficit) and trunk flexion (25% deficit). Deep water traction improved the verbal pain rating to a 3/10 and centralized the pain in his low back. Minimal verbal cueing was needed for facilitation of the core musculature when completing the exercise program. Neurological assessment was done by the straight leg raise and the results showed neurological symptoms at 25 degrees of hip flexion.

The third and fourth week of aquatic therapy/core stabilization showed minimal results and the patient began to lose compliance with the home exercise program. Extension exercises aggravated the patient's back and he reported global stiffness with trunk movement. No ROM improvements were gained and pocket edema was still present around L3-S1. Deep water traction produced minimal benefits with pain relief (4/10) and had been the only exercise to relieve back pain. Grade II posterior-anterior mobilizations were completed on the L4 and L5 spinous process and the joint play assessment caused symptoms to peripheralize down to the right knee.

At the end of four weeks of aquatic therapy/core stabilization the patient was very disappointed in the treatment's results and wanted to try a different approach. His pain was still persistent; however he reported it was localized in his low back and not traveling down his right buttock. Trunk ROM was still lacking and he only regained 10% of extension and 25% of flexion. Right side bending was still painful and the patient compensated by flexing forward. No objective measurements were taken of the lower extremity ROM but the patient reported feeling more flexible. Table 3 shows the

percentage deficits of the final trunk ROM before discharge from aquatic therapy.

Straight leg raise test showed positive neurological symptoms and showed no improvement from the initial visit. The patient demonstrated good body mechanics and understood the preventive measures to avoid reinjuring his back.

Trunk Motion	% of Deficit	Endfeel
Flexion	25%	Empty
Extension	15%	Empty
Right Sidebending	10%	Not assessed
Left Sidebending	25%	Empty
Right Rotation	50%	Empty
Left Rotation	50%	Empty

After the aquatic therapy approach, the physician referred the patient to the Work Fit program. The program schedule was set at 4 hours per day, 5 days a week, for a total of 3 weeks. Patient compliance was very good and no scheduled interventions were missed throughout the 5 weeks. After five weeks of Work Fit, the patient achieved the main program goal of recovering 30% to 45% of functional work-related capacities. The patient's gait sequence showed no signs of deficits and the patient was capable of ambulating at 6 miles per hour for over 20 minutes. The patient reported the sleep class improved his sleep cycle and he was capable of 9 hours of uninterrupted rest. All trunk motions were close to normal limits and there was minimal pain at end range for extension.

Table 4- Final Assessment of Trunk ROM (Work Fit)		
Trunk Motion	% of Deficit	Endfeel
Flexion	0%	Soft tissue approximation
Extension	0%	Firm (end range pain)
Right Sidebending	10%	Firm
Left Sidebending	0%	Firm
Right Rotation	10%	Firm
Left Rotation	10%	Firm

The patient demonstrated proficient body mechanics in lifting and functional mobility at the end of Work Fit. The patient reported being able to sit pain-free for 2 hours without paresthesia in the right buttock. At the end of Work Fit, the patient was very impressed with the improved results and continued to use a generalized exercise program at the physical therapy gym. In addition to the exercise program, the patient discontinued smoking and had lost a total of 12 lbs by the time of discharge.

## CHAPTER V

### DISCUSSION

Chronic low back pain is a very difficult injury to treat conservatively and the challenge is for the healthcare provider to choose the most appropriate plan of care. Aquatic therapy and core stabilization was the initial treatment choice and established early dynamic trunk movements while keeping the lumbar spine stabilized. Multidisciplinary treatment approached the diagnosis not directly to the impairments but by way of a detailed study of improving the whole body. Pain management was done through body modifications, stress relief, pharmaceutical agents, psychological counseling, and pain modulation. In this specific case study, aquatic therapy/core stabilization resulted in minimal benefits in reducing the symptoms, but this outcome does not prove that particular intervention option as being inferior when treating back injuries. The patient showed pain-related fears of trunk movement and it obviously affected the progression of aquatic therapy. A systematic review by Lewis et al,<sup>26</sup> found prescribed physical therapy programs, such as aquatic therapy, to be very beneficial in treating chronic low back pain. While another systematic review by Barr et al,<sup>28</sup> found significant results with the reliance of lumbar stabilization exercises to low back treatment.

This individual found the best results in Work Fit and not only did his back issues resolve but his general health improved. The results of this case report coincide with past literature and help strengthen the proposition that when treating a chronic back injury, the

healthcare provider needs to modify the pain-related fears of movement.<sup>9,10,21,23</sup> A recent study by Buchner<sup>29</sup> et al examined the efficacy of the multidisciplinary approach by treating patients with different grades of back pain chronicity. The results showed all groups improved in back-to-work status, generic health status, pain intensity, functional capacity, and satisfaction with the therapy.<sup>29</sup> In conclusion, the patient found the best results in a multidisciplinary treatment because the program restored all the diverse facets that correlate with a debilitating and chronic injury.

There were a few limitations in this case study that were present in the plan of care. One limitation to this case study was the minimal objective measures that were taken such as strength assessment for the Work Fit program. During the Work Fit program, the involved student physical therapist (and author) for this case study was not present during the intervention portion and received weekly updates at the meetings.

For future research, the clinician should look into each intervention option independently and find the beneficial effects to chronic back pain. Presently, the accumulated research for multidisciplinary approach is small and there needs to be more clinical research on this specific therapeutic method. Research in treating back pain with aquatic therapy is also very minimal and future studies should aim for reviewing structured programs specifically on lumbar pain.

#### Reflective Practice

When reflecting back at the case study and all of the involved components, there is additional information that can be included. The history was quite in-depth but there were a few questions that were never asked in the evaluation process. More questions should have focused on the patient's psychological status because it was a major



contributor to the chronic back pain. In addition, a better idea of his activity level and examples of some of his hobbies would have helped in creating sufficient goals for his recovery.

The examination process could also have been modified by using additional tests to help clarify the patient's injury. When completing the straight leg raise test, the examiner could have tested the sciatic nerve's integrity by using tensioner and flossing techniques and to assess neural tethering in a specific region of the right leg. In most situations, the generation of tension as in a tensioner is more likely to induce neurological symptoms and protective muscle responses.<sup>30</sup> Also the examination would have been more detailed if ROM measurements of the lower extremities were completed, because those deficits clearly affected the patient's mobility.

With concerns to modifying the plan of care, there could have been positive results with McKenzie extension exercises. In the initial visit, the patient described pain relief when propped up in extension and the treatment could have shifted to dry land extension exercises. The two factors that affected the pool therapy decision were: the referring physician's orders for pool therapy, and the prior failed attempts of physical therapy. With limited results in week 3 and 4 of pool therapy, the plan of care should have changed earlier to Work Fit. An earlier move to Work Fit would have resulted in better cost-effectiveness for the insurance company, physical therapist, and patient. Another modification to the plan of care could have been the use of electrical stimulation such as TENS for the home exercise program. This modality is a common analgesic used in conservative treatment and may have promoted better compliance to physical therapy.

When the patient was assigned to Work Fit, the established medical team covered all the aspects of health. The blend of all the professions helped create a plan of care that was extremely efficient. One professional that could have been included because of the patient's weight could have been a registered dietician. The established exercise program helped with weight loss but the patient needed some skilled counseling on proper diet control.

## REFERENCES

1. Brotzman SB, Wilk KE. *Clinical Orthopedic Rehabilitation*. Second ed. Philadelphia, PA; Mosby, 1996: 558-559.
2. Wheeler AH, Pathophysiology of Chronic Back Pain; eMedicine <http://www.emedicine.com/neuro/TOPIC516.HTM>. Accessed Feb. 21, 2008.
3. Cluett J, About website; <http://orthopedics.about.com/cs/herniateddisk/a/ruptureddick.htm>. Accessed Feb. 21, 2008.
4. Lumbar Discectomy, <http://spinalneurosurgery.com/lumbar%20discectomy.htm>. Accessed Feb. 25, 2008.
5. Atlas SJ, Deyo RA, Keller RB, et al. The Maine lumbar spine study, part II. 1-year outcomes of surgical and nonsurgical management of sciatica. *Spine*. 1996; 21(15): 1777-1786.
6. Koes BW. Surgery versus intensive rehabilitation programmes for chronic low back pain. *BMJ*, 2005;330:1220-1221.
7. Aquatic therapy Source, [www.pooltherapy.com](http://www.pooltherapy.com). Accessed March 4, 2008.
8. Barone D, Gangaway JMK. Aquatic physical therapy for low back pain: what are the outcomes? *J Aquatic Phys Ther*. 2007;15(2):18-24.
9. Sieben JM, Vlaeyen JWS, Portegijs PJM, et al. General practitioners' treatment orientations towards low back pain: influence on treatment behaviour and patient outcome. *European Journal of Pain*. 2008;23(8):58-63.
10. Thomas JS, France CR, Sha D, Wiele N. The influence of pain-related fear on peak muscle activity and force generation during maximal isometric trunk exertions. *Spine*. 2008;33(11):342-8.
11. Karjalainen K, Malmivaara A, van Tulder M, et al. Multidisciplinary biopsychosocial rehabilitation for subacute lowback pain among working age adults (Review). *Cochrane Database of Systematic Review*. 2003: Issue 1. Art. No.:CD002193.
12. O'Sullivan S, Schmitz TJ. *Physical Rehabilitation*. 5th ed. Philadelphia PA: FA Davis Co;2007:164.

13. Garratt A, Ruta DA, Abdalla MI, Buckingham JK, Russell IT. The SF 36 health survey questionnaire: an outcome measure suitable for routine use within the NHS. *BMJ*. 1993;306:1440-1444.
14. Norkin CC, White DJ. *Measurement of Joint Motion. A Guide to Goniometry*. 3rd ed. Philadelphia PA: F.A. Davis Co;2003:331-363.
15. Reese NB. *Muscle and Sensory Testing*. 2nd ed. St. Louis MO: Elsevier Saunders; 2005:213-227.
16. Rabin A, Gerszten PC, Karausky P, Bunker CH, Potter DM, Welsh WC. The sensitivity of the seated straight-leg raise test compared with the supine s traight-leg raise test in patients presenting with magnetic resonance imaging evidence of lumbar nerve root compression. *Archives of Physical Medicine and Rehabilitation*. 2007;88(7):840-3.
17. Peeler J, Anderson JE. Reliability of the Ely's test for assessing rectus feroris muscle flexibility and joint range of motion. *J Orthop Res Soc*. 2008;26(6):793-799.
18. American Physical Therapy Association. *Guide to Physical Therapist Practice*. 2nd ed. Alexandria VA, 2003:216-7.
19. Dionne CE, Bourbonnais R, Fremont P, Rossignol M, Stock SR, Larocque I. A clinical return-to-work rule for patients with back pain. *CMAJ*. 2005;172(2):1141-1143.
20. Dryden J. Washington University in St. Louis, <http://mednews.wustl.edu/tips/page.normal/9559.html>. Accessed May 20.
21. McIlveen B, Robertson VJ. A randomized controlled study of the outcome of hydrotherapy for subjects with low back or back and leg pain. *Physiotherapy*. 1998;84(1):17-26.
22. Barr KP, Griggs M, Cadby T. Lumbar stabilization: a review of core concepts and current literature: part 2. *Am J Phys Med Rehabil*. 2007;86(1):72-80.
23. Hubbard TJ, Aronson SL, Denegar CR. Does cryotherapy hasten return to participation? A systematic review. *J Athl Train*. 2004;39(1):88-94.
24. Guzman J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, Bomardier C. Multidisciplinary bio-psycho-social rehabilitation for chronic low-back pain. *Cochrane Database of Systematic Reviews*.2005:(2).
25. Weldon S. The efficacy of stretching for prevention of exercise-related injury: a systematic review of the literature. *Man Ther*. 2003;8(3):141-148.

26. Lewis A, Morris ME, Walsh C. Are physiotherapy exercises effective in reducing chronic low back pain? *Phys Ther Rev.* 2008;13(1):37-44.
27. Morley S, Eccleston C, Williams A. Systematic review and meta-analysis of randomized controlled trials of cognitive behavior therapy and behavior therapy for chronic pain in adults, excluding headache. *Pain.* 1999;80:1-13.
28. Barr KP, Griggs M, Cadby T. Lumber stabilization: a review of core concepts and current literature, part 2. *Am J Physical Med Rehabil.* 2007;86(1):72-80.
29. Buchner M, Neubauer E, Zahlten-Hinguranage A, Schiltewolf M. The influence of the grade of chronicity on the outcome of multidisciplinary therapy for chronic low back pain. *Spine.* 2007;32(26):3060-3066.
30. Butler DS. *The Sensitive Nervous System.* Adelaide, Australia: Griffin Press;2000:288-284.