MANUAL FOR TREATMENT OF LATERAL EPIONDYLITIS WITH THE USE OF THERAPEUTIC ELASTIC TAPE IN A CLINICAL SETTING

A Project

Presented to the faculty of the Department of Kinesiology and Health Science

California State University, Sacramento

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

in

Kinesiology

(Exercise Science)

by

Bjay Patel

SPRING
2016
Student:  Bjay A Patel

I certify that this student has met the requirements for format contained in the University format manual, and that this project is suitable for shelving in the Library and credit is to be awarded for the project.

__________________________, Graduate Coordinator
Daryl Parker, PhD

____________________________________
Date

Department of Kinesiology and Health Science
Abstract

of

MANUAL FOR TREATMENT OF LATERAL EPIONDYLITIS WITH THE USE OF THERAPEUTIC ELASTIC TAPE IN A CLINICAL

by

Bjay Patel

Statement of Purpose

This project aims to provide an effective treatment manual for physical therapists, occupational therapists, and physical therapist assistants to treat individuals diagnosed with lateral epicondylitis with the utilization of therapeutic elastic tape as an additive modality.

Sources of Data

The project consisted of data collected through a medical records review and previous research containing treatment outcomes with the use of therapeutic elastic tape in rehabilitation.

_______________________, Committee Chair
Rodney Imamura, PhD

_______________________
Date
I would like to graciously thank the faculty of the Kinesiology and Health Science department for their efforts in providing quality education and the desire to pursue higher learning.
# TABLE OF CONTENTS

Acknowledgements ............................................................................................................ vi

List of Figures .................................................................................................................... ix

1. INTRODUCTION .......................................................................................................... 1
   Purpose of the Project ................................................................................................. 3
   Scope of the Project .................................................................................................... 3
   Significance of the Project ......................................................................................... 4

2. REVIEW OF LITERATURE ......................................................................................... 5
   Introduction .................................................................................................................. 5
   Anatomy ..................................................................................................................... 6
   Diagnosis and Symptoms of Lateral Epicondylitis ..................................................... 6
   Treatments .................................................................................................................. 7
   Therapeutic Elastic Tape ............................................................................................ 9
   Summary ................................................................................................................... 12

3. METHODOLOGY ....................................................................................................... 13
   Sources of Data .......................................................................................................... 13
   Clinical Data ............................................................................................................. 13

4. PROJECT ...................................................................................................................... 15
   Section 1: Diagnosis ............................................................................................... 15
   Section 2: Measurements ....................................................................................... 15
   Section 3: Treatment ............................................................................................... 18
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Range of Motion Measurement for Lateral Epicondylitis</td>
<td>17</td>
</tr>
<tr>
<td>2 Grip Strength Measurement for Lateral Epicondylitis</td>
<td>18</td>
</tr>
<tr>
<td>3 Manual Manipulation on Lateral Epicondylitis</td>
<td>20</td>
</tr>
<tr>
<td>4 1st Progression of Passive Stretching Exercise</td>
<td>21</td>
</tr>
<tr>
<td>5 2nd Progression of Passive Stretching Exercise</td>
<td>22</td>
</tr>
<tr>
<td>6 3rd Progression of Passive Stretching Exercise</td>
<td>23</td>
</tr>
<tr>
<td>7 4th Progression of Passive Stretching Exercise</td>
<td>24</td>
</tr>
<tr>
<td>8 Starting Position of Eccentric Strengthening Exercise #1</td>
<td>25</td>
</tr>
<tr>
<td>9 End Position of Eccentric Strengthening Exercise #1</td>
<td>26</td>
</tr>
<tr>
<td>10 Starting Position of Eccentric Strengthening Exercise #2</td>
<td>27</td>
</tr>
<tr>
<td>11 End Position of Eccentric Strengthening Exercise #2</td>
<td>28</td>
</tr>
<tr>
<td>12 Ultrasound Therapy for Lateral Epicondylitis</td>
<td>29</td>
</tr>
<tr>
<td>13 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>31</td>
</tr>
<tr>
<td>14 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>31</td>
</tr>
<tr>
<td>15 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>32</td>
</tr>
<tr>
<td>16 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>33</td>
</tr>
<tr>
<td>17 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>34</td>
</tr>
<tr>
<td>18 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>35</td>
</tr>
<tr>
<td>19 Application of Therapeutic Elastic Tape for Lateral Epicondylitis</td>
<td>36</td>
</tr>
</tbody>
</table>
20 Comparison between values of pre and post “Best” pain sensation ............................ 38
21 Comparison between values of pre and post “Worst” pain sensation ......................... 39
22 Comparison between pre and post measurements of range of motion ...................... 40
23 Comparison between pre and post measurements of grip strength .......................... 41
Chapter 1  
INTRODUCTION

Therapeutic elastic tape is a recently developed innovation that has been prominently utilized in clinical settings, recreational activities, and to improve athletic performance. The tape is fabricated from elastic cotton and applied with a heat-activated acrylic adhesive. The elastic tape product has claimed to be effective in aligning weak muscles, assisting in joint motion, promoting blood flow, increasing lymphatic circulation, and reducing the sensation of pain.

Lateral epicondylopathy is a condition of the elbow where the tendons that connect the forearm muscles to the outer elbow become inflamed and tender. This condition is also referred to as ‘Tennis Elbow.” Acute or chronic inflammation occurs from repetitive use of tendons and forearm extensor muscles. Signs and symptoms include pain and tenderness originating from the outer part of the elbow, pain with stretching of tissue, and weakened grip strength. Symptoms can range from mild to severe and last weeks to months with the injury. Common treatments for lateral epicondylopathy are rest, anti-inflammatory medicine, therapeutic rehabilitation, and or surgery.

Research on the use of therapeutic elastic tape in a clinical setting has shown mixed results in the tape’s effectiveness to improve specific musculoskeletal injuries and functional performance (Taylor, 2015). Emphasis on different disorders and body parts
with variable methodologies of experiments allow for inconsistent results in research on therapeutic elastic tape. Training and treatment manuals are formulated to be effective based on previous research and scientific findings.

As a foundation of data to support the necessity of this treatment manual, medical information of patients of Sutter Physical and Hand Therapy were accessed and granted by the Sutter Health Institutional Review Board. Treatment sessions consisted of pre and post measurements of grip strength, range of motion, and pain sensation of the subject measured on a Visual Analog Scale. Measurements from the initial visit to the discharge visit were compared to express signs of improvement or regression.

Pain was measured at the initial treatment visit and again at the final discharge visit. Pain was assessed on a scale of 0-10: 0 meaning “No Pain” and 10 meaning “Severe Pain”. Pain was divided into two measurements: “Best” meaning the least amount of pain experienced from the injury and “Worst” classified as the most amount of pain experienced from the use of the affected limb or injury. In the Control Group, “Best” pain eased 1.5556 +/- 1.3333 and “Worst pain minimized 3.4444 +/- 2.609 toward the 0 on the pain scale. In the Tape group, “Best” pain eased by 2.571 +/- 2.572 and “Worst” pain alleviated by 5.1428 +/- 2.4102 toward the 0 on the pain scale (Appendix A)

Range of motion was also measured at the initial treatment visit and again at the final discharge visit. Range of motion was assessed using passive flexion at the wrist of
the affected limb. The Control Group expressed a 6.667 +/- 3.445 degree increase in range of motion. The Tape Group represented a 0.1667 +/- 9.579 degree increase in range of motion (Appendix A).

Grip strength was measured by gripping and squeezing a dynamometer with an outstretched arm. Measurements are calculated using an average of three trials performed the same way consecutively. The Standard group displayed a 8.3222 +/- 9.1659 pound increase in maximal grip strength. The Tape Group demonstrated a 15.3443 +/- 12.2892 pound increase (Appendix A).

**Purpose of the Project**

Therefore, the aim of this project was to develop a treatment manual of utilizing therapeutic elastic tape as an additive modality in treatment of lateral epicondylitis in a clinical setting in order to improve measurements of grip strength, range of motion, and sensation of pain.

**Scope of the Project**

The project consists of a treatment manual for lateral epicondylitis, inflammation of the outer elbow due to overuse, which may be used by physical therapists, occupational therapists, and physical therapist assistants to treat patients with the disorder. The treatment manual is comprised of a variety of treatment modalities utilized in a clinical setting such as manual therapy, stretching, strengthening, ultrasound therapy, and the application of therapeutic elastic tape over the affected area.
Significance of the Project

The anticipated benefits of the project may provide improved understanding of lateral epicondylitis and insight for better quality care and treatment outcomes in rehabilitation. Lateral epicondylitis is considered one of the most prominent overuse injuries and the most common affliction of the elbow. Examining and understanding the effectiveness of this treatment manual on the injury may allow for an accelerated recovery, decreased symptoms of pain, and overall improvements in ability to perform activities of daily life for individuals affected by lateral epicondylitis.
Chapter 2
REVIEW OF THE LITERATURE

Introduction

Therapeutic elastic tape has become a widely utilized product for the intent of improving function, reducing pain, and injury prevention. Studies involving the use of therapeutic elastic tape have yield mixed outcomes on a variety of injuries and functional tests. Previous research has shown significant positive outcomes for the use of therapeutic elastic tape on upper extremity injuries and functional measures. A study evaluated the effectiveness of the combination of ultrasound, TENS, and therapeutic elastic taping as treatment for lateral epicondylitis over a 24-48 hour period subjects repeated trials and demonstrated a significant decrease in pain and improvement in range of motion (Chen & Lai, 2008). Significant results have also been demonstrated on recovery in children with brachial plexus injury after 12 sessions of therapeutic elastic tape treatment (Walsh, 2010). Therapeutic elastic tape has also shown to significantly improve range of motion in subjects with mallet finger after 4 weeks of treatment (Devan, 2014). Previous research has shown that therapeutic elastic tape treatment of injuries are a worthwhile study to conduct. Further research of the product effectiveness on injuries, such as lateral epicondylopathy, can provide knowledge on improving quality of care provided by healthcare professionals and therapists.
Anatomy

Lateral epicondylopathy is a condition of the elbow where the tendons that connect the forearm muscles to the outer elbow become inflamed and tender. The condition involves weakness of the tendons of the elbow joint and extensor muscles of the forearm. The name of the condition originates from the attachment site of the forearm muscles to the humerus bone, the lateral epicondyle. The lateral epicondyle on the distal humerus is a bony landmark that is the site of friction during repetitive contractions of the forearm muscles and extension and flexion of the elbow.

The forearm extensor muscles affected by lateral epicondylitis are the extensor carpi radialis brevis, extensor carpi radialis longus, and extensor digitorum (Peters & Baker, 2001). Weakened extensor muscles can contribute to lateral epicondylopathy. An electromyographic study conducted to simulate the forearm extensor and flexor muscles during simulated grip work showed significant fatigue signs of the extensor muscles compared to flexor muscles (Hagg & Milerad, 1997).

Diagnosis and Symptoms of Lateral Epicondylitis

Overuse and repetitive motions of the elbow can exert strain on the extensor muscles of the forearm and cause tears to the tendons of the elbow. These tears may cause pain, tenderness, and inflammation at the outer part of the elbow. Weak grip strength is commonly associated with lateral epicondylopathy. Symptoms can vary from mild to severe. Trauma or forceful movement are also linked to cause lateral epicondylopathy (Kurppa, Waris & Rokkanen, 1979). Lateral epicondylopathy may be
accelerated by poor conditioning of the muscles of the upper arm, improper technique, or improper use of equipment. Popularly coined as “Tennis Elbow,” the condition extends beyond a sports induced injury into professions such as office workers, construction, and painting. Tennis players diagnosed with lateral epicondylopathy only account for approximately 5% of the diagnosed population (Kitai, Itay, Ruder, Engel & Modan, 1986).

The condition must be assessed by a physician in order to be diagnosed. A physician will perform a variety of tests on the forearm and elbow by applying pressure in the affected area. The physical examination may include: assessing tenderness approximately 1-2 cm away from the lateral epicondyle, pain sensation when lifting objects with the palm facing down, measuring active and passive range of motion at the wrist, and visible signs and symptoms (Sakr, Ditto & Stafford, 2010). Digital imaging such as an X-ray or MRI may be necessary to confirm diagnosis and exclude additional causes for symptoms. Medical history of the patient can additionally be used to distinguish any relative injuries or conditions that may have contributed to the symptoms.

**Treatments**

There are a variety of treatments used to alleviate the symptoms of lateral epicondylopathy. Rest, steroidal and nonsteroidal anti-inflammatory drugs, physical therapy, and surgery are the most viable options to treat the condition. There are various other methods of treatment for lateral epicondylopathy; however, research on the most effective treatments are inconclusive (Smidt, Van der Windt & Assendelft, 2002). Rest is
encouraged for mild symptoms or acute onset. Taking a break from the certain activity or repetitive motion that induced the condition can alleviate the symptoms. The recommended break from aggravating activity may last a couple of days to several weeks. Ensuring a proper break in between activities may help prevent the symptoms from occurring.

Anti-inflammatory medication such as ibuprofen, aspirin, and naproxen sodium are common over-the-counter products that can be purchased to treat the symptoms. These drugs and creams are consumed or applied with the intent to combat inflammation and reduce pain, swelling, and tenderness of the affected area. Research has shown that topical anti-inflammatory medication produces short term benefits in treatment of lateral epicondylopathy (Regan & Grondin, 2009). In an international survey to surgeons on the treatment of lateral epicondylitis, 38% of the surveyed surgeons recommended the use of anti-inflammatory medication (Amar, Chechik & Khashan 2014).

Physical therapy is the staple for treating lateral epicondylopathy. A licensed physical or occupational therapist will assess each condition individually. Many times a therapist will ask a series of questions and run a battery of initial tests during evaluation in order to provide baseline measurements such as gauged grip strength, active and passive range of motion, and quantify subjective complains during certain activities of daily living and at rest. The therapist will provide individualized treatment plans in order to progressively reach the goals of the patient. Components of the treatment plan often include deep tissue massage, joint manipulation, active extensor stretching, eccentric
wrist extensor exercise, bracing, activity modification along with various modalities such as ultrasound, electrical stimulation, iontophoresis, cryotherapy, and therapeutic elastic tape (Whaley, 2004). An average length of treatment for lateral epicondylopathy is six to eight weeks. Previous research has been conducted to determine the efficacy of these modalities and treatments on lateral epicondylitis. The incorporation of eccentric exercises has led to findings of improved outcomes on individuals with lateral epicondylitis (Cullinane & Trevelyan, 2014). A study was conducted to assess the effectiveness of cryotherapy on lateral epicondylitis. Results showed that treatments groups utilizing cryotherapy and therapeutic exercise exhibited improvements in pain levels and grip strength compared to a control group (Agostinucci, McLinden & Cherry, 2012).

Physical therapy is the most preferred route to treat the condition resulting in 95% of the diagnosed lateral epicondylitis (Sakr, Ditto & Stafford, 2010). However, some severe cases of lateral epicondylitis may require surgery. Surgery procedure typically involves the removal of degenerated tissue and muscle of the extensor tendon then reattaching healthy muscle and tendon to the origin. One week of immobilization is generally advised and may take up to 6 months to recover. Patients would typically be referred to physical therapy to improve recovery following surgical intervention.

**Therapeutic Elastic Tape**

In recent years, therapeutic elastic tape has had a prominent rise in popularity and use in therapeutic rehabilitation and injury prevention. The philosophy of therapeutic
elastic taping was developed in the 1970’s by Japanese chiropractor Dr. Kenso Kase (Miralles, Monterde & Del Rio, 2014). The tape was created with the purpose to improve the conventional method of taping without limiting ability or range of motion. The tape possesses qualities such as having a 140% elastic stretch, water-resistance, heat activated adhesive, and being hypoallergenic. The elasticity of the tape was designed to mimic human skin. A study to determine whether skin taping with the tape would reduce sternal skin stress during upper extremity functional movements showed that there was less deformation of skin with the elastic tape compared to no tape (Irion, Cauthen, Gallo, Jackson & Kremer, 2010). Elastic ability to mesh and support the skin allows it to be able to reduce dehiscence or the rupture of a surgical suture. Use of the tape claims the possibility of benefits such as aligning and supporting weak muscles, increasing blood and lymphatic flow, assisting joint motion, and alleviating sensation of pain.

Various therapeutic qualities and functional claims made by utilizing therapeutic elastic tape has made it a controversial topic when discussing its efficacy. Published research has been done and current research is being conducted to test if whether the tape lives up to its claims. The problem with that is research on therapeutic elastic tape have been done for different purposes on a variety of conditions that extend from assessing its effects on ankle proprioception (Miralles et al, 2014) to its ability to reduce lymphedema in breast cancer patients (Morris, Jones, Ryan & Ryan, 2013). These studies allow for a foundation for future high quality research. The effects of therapeutic elastic tape on the recovery of lateral epicondylopathy have not been researched in depth. Research has
shown that therapeutic elastic tape along with the modalities ultrasound and electric stimulation significantly improved range of motion and reduced pain level 24-48 hours after treatment for lateral epicondylitis (Chen et al, 2008). A limitation of the study is the lack of a control group to assess taping versus other modalities on the range of motion and pain compared to the other modalities used. Therapeutic elastic tape has shown significant results in studies treating similar injuries to lateral epicondylopathy such as shoulder impingement. Physical therapy and additive therapeutic elastic tape resulted in lower pain and disability scores than standard physical therapy treatment during the first two weeks of use (Kaya, Zinnuroglu & Tugcu, 2010). Future research for therapeutic elastic tape on lateral epicondylitis is important in order to determine its possible benefits on recovery and effectiveness of treatment.

There are a few variations for placement of therapeutic elastic tape for lateral epicondylitis. The tape is positioned to support the extensor carpi radialis brevis muscle. One method is taping from the origin to the insertion of the extensor carpi radialis brevis muscle while the elbow is extended and the wrist flexed. Another piece of tape is wrapped around the extensor tendon of the elbow. Another common method of taping lateral epicondylitis is using a Y-shape pattern to support the lateral and medial compartments of the extensor carpi radialis brevis muscle. The elbow will be extended and wrist flexed and another piece of tape will be used to wrap around the extensor tendon. The tape may remain on the affected limb for up to a few days or if the tape naturally starts coming off before then.
Summary

As the popularity of innovative materials, techniques, and ideas enter the sports medicine and fitness world, it is important to research and validate the claims made by companies and industry professionals on their products. The clinical applications of therapeutic elastic tape on treating lateral epicondylitis are lacking in published journals and research. Therapeutic elastic tape aims to improve a number of aspects of injury prevention, inflammatory response, and recovery (Drouin, McAlpine, Primak & Kissel, 2013). The efficacy of therapeutic elastic tape as an additive tool in possibly improving clinical intervention and successful treatment of lateral epicondylitis is an area of research worth studying.
Chapter 3
METHODOLOGY

Sources of Data

Components of the project required background clinical information in a rehabilitation setting, research on treatment methods on lateral epicondylitis, and research on treatment outcomes with the utilization of therapeutic elastic tape on lateral epicondylitis and a variety of musculoskeletal injuries and disorders. Research involving successful treatment outcomes on lateral epicondylitis and consultation with licensed physical therapists and occupational therapists allowed for the elements and knowledge of treatment manual for the condition.

The project additionally extracted data collection through a medical records review. Data access exclusively from physical therapy sessions at Sutter Physical and Hand Therapy was accessed. Participants of the study were patients at Sutter Physical & Hand Therapy being administered for a New Patient Evaluation for Diagnosis 726.32 (ICD-9-CM) - Lateral epicondylitis. Patient must have been referred to therapy by a physician.

Clinical Data

Data was collected through a medical records review granted by Sutter Health. Data exclusively from physical therapy sessions at Sutter Physical and Hand Therapy Sac Sierra Region were accessed. Treatment sessions consisted of pre and post measurements of grip strength, range of motion, and pain sensation of the subject.
measured on a Visual Analog Scale. Data collected compared the difference in pre and post measurements of grip strength, range of motion, and pain level between two groups of patients; patients with treatment of lateral epicondylitis at Sutter Physical and Hand Therapy that involved the application of therapeutic elastic tape in Plan of Care and patients with treatment of lateral epicondylitis at Sutter Physical and Hand Therapy that did not involve the application of therapeutic elastic tape in Plan of Care. Pre and post treatment data between the two groups were compared to identify if there was a significant improvement in recovery of lateral epicondylitis with the application of therapeutic elastic tape as shown in Appendix A.
Section 1: Diagnosis

Lateral epicondylitis is a condition of inflammation of the tendons of the forearm extensor muscles at the outside of the elbow. The condition is often caused by repetitive motions of wrist extension. Overuse of a certain action or movement causes stress and excessive pull of the tendons and allow the tendons that attach those muscles to the elbow to degenerate. Specific trauma to the forearm extensor muscles can produce symptoms of lateral epicondylitis. Those microscopic tears enable an inflammatory response to the area which causes weakness, pain, and limited range of motion. Tenderness occurs at the outer elbow on the lateral epicondyle of the humerus, the origin site of the common extensor muscles of the wrist and fingers.

Signs and Symptoms of lateral epicondylitis tend to have a gradual onset. Pain and tenderness at the outer elbow is the primordial marker for lateral epicondylitis. Pain can range from mild to severe depending on condition. It can often be associated with a weakened grip strength, pain when lifting heavy objects, and aggravation when performing a specific activity or movement.

Section 2: Measurements

A standard evaluation of lateral epicondylitis consists of measuring grip strength, range of motion, and pain sensation of the affected area. Measurements of these categories are compared from the initial visit to the visit of discharge to assess
improvement or regression of the injury. Grip strength is measured by an average of three trials using a hand dynamometer, an instrument that measures force output. Elbow fully extended and palm facing down when attempting trials shown in Figure 2.2. Range of motion is measured at the wrist during wrist flexion using a goniometer, an instrument used to measure angles of anatomical body parts shown in Figure 2.1. Sensation of pain is measured by a Visual Analog Scale from 0-10 for “Best” and “Worst” pain. “Best” meaning the least amount of pain from the injury and “Worst” meaning the greatest amount of pain from the injury or using the affected limb. “0” representing no pain symptoms and “10” representing severe pain. The number of visits per patient is evaluated by the therapist depending on severity of injury and progression through visits. At the visit of discharge the measurements of range of motion, grip strength, and pain sensation are taken with the protocol used during the initial visit.

A typical physical therapy treatment plan consists of mobility and strengthening exercises instructed by the physical therapist, deep tissue massage, ultrasound modality, and may contain the utilization of therapeutic elastic tape (Whaley, 2004). It is important that treatment modalities are consistent for each session. As a licensed therapist, you may assess the number of sessions and session frequency per week that your individual patient may need. You will also assess the sets and repetitions of stretching and strengthening exercises based on patient abilities.
Figure 1 Range of Motion Measurement for Lateral Epicondylitis. Range of motion of wrist extensor muscles is measured utilizing a goniometer with the elbow in extension and in a fist performing flexion at the wrist.
Figure 2 Grip Strength measurement for Lateral Epicondylitis. Grip strength is assessed utilizing a dynamometer with the elbow in extension and palm facing down.

**Section 3: Treatment**

Nonsurgical treatments of lateral epicondylitis are used to help alleviate pain and manage symptoms. Activity modification by limiting the aggravating activity or motion may help diminish pain and symptoms. If symptoms do begin to exacerbate then applying ice on the affected area may reduce pain and swelling. The use of cryotherapy, application of cold temperature on damaged tissue, exhibited improvements in pain levels (Agostinucci et al, 2012). The use of nonsteroidal anti-inflammatory drugs (NSAID) such as ibuprofen and Aspirin may help reduce inflammation and pain. 38% of an international survey of surgeons recommended the use of anti-inflammatory medication
on lateral epicondylitis (Amar et al., 2014). If symptoms do not resolve on its own a physician may refer the patient with lateral epicondylitis to physical therapy. A consistent treatment regimen for lateral epicondylitis has shown to be more effective than just the use of corticosteroids and NSAIDs (Nilsson, Baigi, Sward, Moller & Mansson, 2011).

**Section 4: Manual Therapy**

Manual therapy techniques or “hands on therapy” are used for joint manipulation and mobilization of the nervous system. The purpose of applying a deep friction massage of the connective tissue is to improve tissue mobility, decrease pain sensation, and regeneration of the wrist extensor muscle strength to improve performance. The procedure for manual therapy on lateral epicondylitis is outlined and demonstrated in Figure 4.1.

**Position**

1. Optimal position is to have the patient lay supine; patient sitting in a chair with arm on a table may be acceptable.
2. The elbow joint is in resting position
3. The clinician is on the patient’s side facing the elbow joint
4. Stabilizing hand grip is on the distal humerus on the lateral side
5. Manipulating grip is on the medial side of the proximal ulna
Procedure

1. The clinician applies Grade I traction to the elbow joint
2. The stabilizing hand grip holds the humerus in position
3. The manipulating hand glides the proximal ulna in a lateral direction

(Edmond, 2006)

Figure 3 Manual Manipulation on Lateral Epicondylitis. Affected elbow in extension with the therapist’s left hand as the stabilizing hand grip and the right hand as the manipulating grip.
Section 5: Passive Range of Motion

Active stretching is a type of muscle stretching that utilizes the individual's own muscle power (Appendix A). Actively positioning the wrist into flexion will cause the affected extensor muscles of the wrist to lengthen and stretch.

Passive Stretching requires the use of an external force, the opposing hand, to provide a further stretch compared to active stretching. Passive stretching is performed through progression of pain-free active stretching as shown in Figures 5.1 to 5.4.

Figure 4 1st Progression of Passive Stretching Exercise. With your elbow bent, bend your wrist toward your body with your opposite hand.
Figure 5 2\textsuperscript{nd} Progression of Passive Stretching Exercise. With your elbow bent and palm down, bend your wrist toward the floor with your opposite hand.
Figure 6 3rd Progression of Passive Stretching Exercise. With your elbow straight, forearm neutral, bend your wrist toward your body with your opposite hand.
Figure 7 4th Progression of Passive Stretching Exercise. With your elbow straight and palm down, bend your wrist toward the floor with your opposite hand.

Section 6: Strengthening

Eccentric strengthening exercises of the extensor muscles are a key component of building up the functional ability of the forearm and wrist. Eccentric strengthening exercises consist of focusing on the eccentric, or lengthening, contraction as the muscle is working as demonstrated in Figure 6.1 through 6.4. Eccentric strengthening exercises has shown to lead to improved outcomes in lateral epicondylitis treatment (Cullinane et al, 2014) and improvements on wrist extensor muscle function at six weeks of treatment (Martinez-Silvestrini, Newcomer, Gay, Schaefer, Kortebein, & Arendt, 2005)
Figure 8 Starting Position of Eccentric Strengthening Exercise #1. Wrist positioned in extension with palm up. Individual will perform slow and concentrated movement upwards into wrist flexion with weight in hand.
Figure 9 End Position of Eccentric Strengthening Exercise #1. Once range of motion is completed, the hand and weight will return slowly into the starting position.
Figure 10 Starting Position of Eccentric Strengthening Exercise #2. Wrist positioned in extension with the palm down. Individual will perform a slow and concentrated movement into flexion with the weight in hand.
Figure 11 End Position of Eccentric Strengthening Exercise #2. Once range of motion is completed, the hand and weight will return slowly into the starting position.

**Section 7: Ultrasound Therapy**

Therapeutic ultrasound is a modality used in physical therapy to treat a variety of injuries and conditions in addition to lateral epicondylitis since the 1940’s. The purpose of ultrasound is to deliver sound waves into deep tissue. Those vibrations from the sound waves excite the tissue and produce heat. The heat stimulates blood circulation in the local area, increases mobility of the tendon and muscles, breakdown of scar tissue and create a warmth sensation to help alleviate pain. Ultrasound is often used in conjunction with a topical anti-inflammatory medicine, this process is known as phonophoresis. Topical anti-inflammatory medication has shown to produce short term benefits in treatment of lateral epicondylopathy (Regan & Grondin, 2009). Research has
demonstrated evidence of potential effectiveness of ultrasound on lateral epicondylitis (Dingemanse, Randsdorp, Koes & Huisstede, 2013).

Figure 12 Ultrasound Therapy for Lateral Epicondylitis. Ultrasound component being applied to the affected local area of the outer elbow.

**Section 8: Therapeutic Elastic Tape**

Therapeutic elastic tape is utilized as an additive modality in traditional physical therapy treatment. The purpose of therapeutic elastic tape is to improve the conventional method of taping without limiting ability or range of motion. The tape possesses qualities such as having a 140% elastic stretch, water-resistance, heat activated adhesive, and being hypoallergenic. The elasticity of the tape is designed to mimic human skin. Use of the tape claims the possibility of benefits such as aligning and supporting weak
muscles, increasing blood and lymphatic flow, assisting joint motion, and alleviating sensation of pain. Taping is applied in a Y-shape pattern through the lateral and medial compartments of the extensor carpi radialis brevis muscle. Wrist is flexed and the elbow extended. The tape is additionally taped around the extensor tendon. The procedure for therapeutic elastic taping for lateral epicondylitis is illustrated in Figures 8.1 through 8.7. The tape is additionally taped around the extensor tendon. Taping is applied by the therapist after the other treatment modalities and at the end of every treatment session. Therapeutic elastic tape may be left on the affected area for 24-48 hours or until the taping becomes worn and wilted and the patient is able to remove it. Taping must be consistent throughout treatment sessions.
Figure 13 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Measure and cut an appropriate amount of tape to cover the dorsal surface of the hand to the lateral epicondyle of the outer elbow.

Figure 14 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Cut two anchor strips for support for the wrist and forearm extensor tendon. Round off corners for better skin adhesion.
Figure 15 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Position the elbow in extension and have the individual slightly flex the wrist. Apply the base of the tape on the dorsal surface of the hand with approximately 30% of a stretch of the tape.
Figure 16 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Cut the tape into lateral and medial compartments into a “Y shape” pattern. Apply the lateral side of the tape along the lateral forearm running through the lateral compartment of the extensor carp radial brevis muscle.
Figure 17 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Apply the medial side of the tape along the medial forearm and medial compartment of the extensor carpi radialis brevis muscle. Make a turn towards the lateral epicondyle with the leftover length of the tape. Apply and anchor strip around the wrist for support and better skin adhesion.
Figure 18 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Apply an anchor strip around the extensor tendon of the lateral epicondyle towards the medial side of the elbow to cover the end of the “Y shaped” tape.
Figure 19 Application of Therapeutic Elastic Tape for Lateral Epicondylitis. Rub along the taped area to activate the “Heat activated” adhesive.

**Section 9: Surgery**

If symptoms do not resolve with physical therapy, then surgery may be required. Surgery consists of debridement of the healthy muscle and re-attaching the healthy muscle. Recovery may take up to four to six months with one-week immobilization after the surgical process.
APPENDIX A
CLINICAL DATA OUTCOMES WITH AND WITHOUT THERAPEUTIC ELASTIC TAPE

A total of 16 subjects were randomly selected for the study. 9 subjects were categorized into the Control Group, which did not involve the application of Kinesiotape in treatment plan. 7 subjects were classed into the Tape Group, which involved the application of therapeutic elastic tape in the treatment plan. Out of the 16 subjects, 9 were female and 7 were male with a mean age of 49.562 +/- 8.516 years old. 8 of the 16 subjects experienced lateral epicondylitis on their dominant limb while the remaining 8 subjects experienced the condition on their non-dominant limb. Subjects completed treatment with an average of 9.1875 +/- 3.311 visits.

Pain Sensation

Pain was measured at the initial treatment visit and again at the final discharge visit. Pain was assessed on a scale of 0-10: 0 meaning “No Pain” and 10 meaning “Severe Pain”. Pain was divided into two measurements: “Best” meaning the least amount of pain experienced from the injury and “Worst” classified as the most amount of pain experienced from the use of the affected limb or injury. In the Control Group, “Best” pain eased 1.5556 +/- 1.3333 and “Worst pain minimized 3.4444 +/- 2.609 toward the 0 on the pain scale. In the Tape group, “Best” pain eased by 2.571 +/- 2.572 and “Worst” pain alleviated by 5.1428 +/- 2.4102 toward the 0 on the pain scale.
Figure 20 Statistical bar graph comparison between values of pre and post “Best” pain sensation of Control group and Tape Group during treatment. Negative values represent a decreased sensation of pain toward the “0-No Pain” scale.
Figure 21 Statistical bar graph comparison between values of pre and post “Worst” pain sensation of Control Group and Tape Group during treatment. Negative values represent a decreased sensation of pain toward the “0-No Pain” scale.

**Range of Motion**

Range of motion was also measured at the initial treatment visit and again at the final discharge visit. Range of motion was assessed using passive flexion at the wrist of the affected limb. The Control Group expressed a 6.667 +/- 3.445 degree increase in range of motion. The Tape Group represented a 0.1667 +/- 9.579 degree increase in range of motion.
Figure 22 Statistical bar graph comparison between pre and post measurements of range of motion for Control Group and tape Group during treatment.

**Grip Strength**

Grip strength was measured by gripping and squeezing a dynamometer with an outstretched arm. Measurements are calculated using an average of three trials performed the same way consecutively. The Standard group displayed an 8.3222 +/- 9.1659 pound increase in maximal grip strength. The Tape Group demonstrated a 15.3443 +/- 12.2892 pound increase.
Figure 23 Statistical bar graph comparison between pre and post measurements of grip strength of Control Group and Tape Group during treatment.
References


