



Bridgewater State University Virtual Commons - Bridgewater State University

Master's Theses and Projects

College of Graduate Studies

5-2015

Effects of Kinesio Tex Tape on Knee Injuries in Collegiate Athletes

Victoria L. Cooley

Follow this and additional works at: <http://vc.bridgew.edu/theses>

 Part of the [Sports Sciences Commons](#)

Recommended Citation

Cooley, Victoria L.. (2015). Effects of Kinesio Tex Tape on Knee Injuries in Collegiate Athletes. In *BSU Master's Theses and Projects*. Item 15.

Available at <http://vc.bridgew.edu/theses/15>

Copyright © 2015 Victoria L. Cooley

This item is available as part of Virtual Commons, the open-access institutional repository of Bridgewater State University, Bridgewater, Massachusetts.

EFFECTS OF KINESIO TEX TAPE ON KNEE INJURIES IN COLLEGIATE
ATHLETES

A Thesis Presented By

Victoria L. Cooley

Submitted to the College of Graduate Studies of Bridgewater State University

in partial fulfilment of the requirements for the degree

of Master of Science in Athletic Training

May 2015

EFFECTS OF KINESIO TEX TAPE ON KNEE INJURIES IN
COLLEGIATE ATHLETES

A Thesis Presented By

Victoria L. Cooley

Approved as to style and content by:

Dr. Pamela Russell, Chairperson of Thesis Committee

Dr. Kimberly Wise, Committee Member

Dr. Robert Colandreo, Committee Member

Acknowledgement

Dr. Pamela Russell, thank you so incredibly much for all you have done for me in the past two years. Taking on a thesis is something I never planned to do but through your teaching, research became an attractive and fun idea. I knew from the start how much I would learn from you and how supportive you would be as a chairperson, but I received much more than I expected. You have been a better teacher, mentor, and support system than I could ever ask. Through your guidance, I have been able to meet my goals and have the confidence in continuing to do so. Again, thank you so much for everything, you have truly made an impact on my life.

To my Thesis Committee Members, thank you so much for your patience, time and effort with me during the research process. Working with each of you has impacted me both personally and professionally. I am so happy each of you agreed to work with me, I couldn't ask for a better group of professionals to learn from.

To my friends and family, thank you for always supporting my goals and dreams. Without each of you by my side I would never be where I am today. You have taught me what it is to be strong, to be confident, to be driven, and to never give up. Each one of you has supported me through the process, from giving your opinions to telling me to calm down and stop stressing out. Your love, support and understanding is what gets me through. I cannot thank you enough.

To my participants and the BSU Athletic Training Staff, thank you for your patience, effort and compliance. It was not an easy process and without each of you I would never have been able to reach this goal. Everything each of you has done is truly appreciated.

To KinesioTex Tape, thank you so much for your in-kind donation to help me research your product. The donation was so helpful and greatly appreciated.

Dedication

This research and thesis is dedicated in part to my dear friend, classmate and angel, Cailey A. Bilodeau. Your strength, drive, ambition and humorous attitude continue to motivate me each and every day. Rest in the easiest of peace.

And to my Mom and Dad, for always supporting me in everything I wish to do. I couldn't do this without you.

Abstract

The purpose of this study was to investigate the effects of KinesioTex Tape on knee conditions in collegiate athletes. Specifically, the study examined the effects of KinesioTex Tape on pain and effusion in patients with patella related knee conditions at Bridgewater State University. The Visual Analog Scale (VAS) was used to measure pain and a measuring tape was used to measure the circumference of the knee. It was hypothesized that KinesioTex tape would decrease the amount of pain and effusion in patella related knee conditions in collegiate athletes. A total of 3 participants were recruited to take part in the research. Recruitment was done through the athletic trainers at Bridgewater State University and through e-mail. Athletes had pre measurements taken after which KinesioTex Tape was applied. Measurements were then taken immediately post application and then again at 36 hours. Data collected showed a decrease in absolute pain scores with all participants, with the greatest decrease being in relative change ranging from 54% to 100%. Girth measurements decreased in all participants at 36 hours but were the same or increased immediately post application. The findings indicated that KinesioTex Tape may assist in decreasing pain and effusion in patella related knee conditions. Future research should aim to further quantify the effects of KinesioTex Tape on all injuries and conditions.

Table of Contents

<u>Section</u>	<u>Page</u>
Introduction.....	1
Review of Literature.....	4
KinesioTex Tape.....	4
Common Mechanism of Injury (MOI).....	5
Pain.....	8
Range of Motion.....	13
Effusion.....	16
Summary.....	18
Methods.....	19
Participants.....	19
Instruments.....	19
Procedures.....	20
Results.....	23
Participants.....	23
Pain Measurements.....	23
Girth Measurements.....	24
Discussion.....	25
Participants.....	25
Pain Measurements.....	25
Girth Measurements.....	26
Limitations.....	27
Future Studies.....	28
References.....	29
Appendix A.....	32
Appendix B.....	34
Appendix C.....	39
Appendix D.....	40

List of Figures

<u>Figure</u>	<u>Page</u>
Figure 1: The Ankle Joint Complex.....	5
Figure 2: Lateral Structures of the Ankle.....	6
Figure 3: Muscles of the Lower Leg.....	7
Figure 4: Visual Analog Scale.....	20
Figure 5: Kinesio Tape Application.....	21

List of Tables

<u>Table</u>	<u>Page</u>
Table 1: Participant Demographics.....	23
Table 2: Pre and Post Pain Assessment.....	24
Table 3: Girth Measurements Pre and Post Application.....	24
Table 4: Girth Measurements Pre and Post Intervention.....	24

Ankle sprains are one of the most common injuries in athletics with over 23,000 seen daily in the United States.¹ In Europe, ankle sprains are the most frequent reason for emergency room and private practice visits, and account for 25% of sports accidents.² With the prevalence of ankle sprains being so high, knowing how to best treat athletes with them is extremely important. Within the allied health profession, the standard protocol involves first focusing on the pain and swelling within the joint. After swelling has dissipated, the individual may progress onto advanced range of motion exercises and will eventually progress in their rehabilitation program.³ Without the patient having edema under control or the optimal healing environment, they cannot further proceed on the return to participation path. Guillodo et al² investigated the impact of rehabilitation on the overall healing and recurrence rate of ankle sprains in patients. Each of their patients followed the rest, ice, compression, elevation (RICE) protocol, used a semi-rigid brace and participated in a standardized rehabilitation protocol. The investigators found that after one year, there was no significant difference between patients that received rehabilitation and those who had not. They concluded that there was no association between rehabilitation and prevention of sprain recurrence or healing of the patients.² This study revealed the need for further investigation into reliable and effective means of rehabilitation protocols for treating ankle sprains. For this reason, any treatment protocol that may help speed the process of reducing swelling and providing an optimal healing environment should be considered.

Recently, there has been some evidence that Kinesio Tape may be used as a modality to prevent injury and assist in rehabilitation. The tape is elastic in nature and made to mimic human skin. It is used directly on the patient's skin over the area of

swelling and injury. Once applied, the tape uses its elastic properties to raise and fold the layers of the epidermis; this raising and folding leads to an increased blood flow to the injured region of the body, increasing lymph flow and in turn decreasing the swelling at the injury site.⁴

Kase and Hashimoto⁵ investigated the effects of Kinesio taping on changes in peripheral blood flow in 9 individuals using Doppler Ultrasound. In subjects with blood flow disorders, the volume of peripheral blood flow increased,⁵ showing that Kinesio Tape may help increase blood flow and in turn provide the optimal environment for healing for the injured patient. Kinesio Tape may also provide a new means of treatment that shows no major adverse events or side effects.⁵ In further examining the healing properties of Kinesio Tape, the claimed effects pose a possible addition to treatment plans that may greatly help allied health professionals in both treatment and rehabilitation of all injured individuals. Not only may the claimed effects assist medical professionals but they may also help the patients be comfortable during the course of their treatment, rehabilitation and return to play.

Current research has examined the effects of Kinesio Tape on factors like edema, proprioception, balance, pain and functional performance^{4,5,7,8}. While all these factors are important, there have been no studies to our knowledge that have quantified the effects of Kinesio Tape on range of motion (ROM), effusion and pain in both chronic and acute ankle sprains. The current literature that presents evidence in these areas has been obtained by self-report, with no evidence from physical measurements. Thus, the purpose of this study was to provide measurement based evidence on the use of Kinesio Tape in treating effusion and pain alongside a standard rehabilitation protocol. Since there were

no ankle sprains over the data collection period, the current study used Kinesio Tape as a treatment protocol for patella related knee conditions in collegiate athletes using one technique to address both effusion and pain. After Kinesio Tape application, the following dependent variables were measured: pain using the visual analog scale and effusion using a measuring tape. It was hypothesized that Kinesio Tape would decrease effusion and pain in patella related knee conditions in collegiate athletes.

The individuals participating in this research, along with the entire health care community may benefit greatly from exploring this question. Zajt-Kwiatkowska et al⁴ and Bialoszewski⁸ indicated decreased pain and edema with the use of Kinesio Tape. This evidence shows the possibility of an increased rate of healing for individuals participating in the study. Furthermore, little evidence is provided, that currently endorses or refutes the use of Kinesio Tape and further evidence will help affirm or negate if it can be a useful treatment option within the athletic community.

Review of Literature

The high occurrence of ankle sprains in athletics makes them a very important topic. However, due to the lack of their occurrence during the duration of this study, the investigators had to change their focus to patella related knee injuries/conditions because that was what was available. Nonetheless, the urgency of getting athletes back to being able to participate both physically and mentally is vital to their participation in sport. Part of getting them back to participation is decreasing the symptoms that prevent them from performing at the high level that is expected of them. The following review of literature will discuss pain, effusion, and range of motion in common ankle sprains and the current research on treatment. It will be evident at the completion of reading that Kinesio Tape must be investigated as a possible treatment option in treating ankle sprains.

Kinesio Tex Tape

Kinesio Tex Tape was invented over 30 years ago by Dr. Kenzo Kase who aspired to have a prescription that was effective between his patients' office visits.⁹ He put his wishes into action and in 1979 the tape was introduced into Japan's rehabilitative hospitals. It then received international recognition at the Seoul Olympics and has been used around the world for rehabilitative purposes since.⁹ The tape is made to mimic human skin in its thickness and weight and is comprised of 100% cotton and elastic fibers. It is latex free with an adhesive that is acrylic and heat-activated. The adhesive on the tape was made to mimic fingerprints in a wave like pattern.⁹ This pattern allows skin to breathe and lymphatic drainage to occur by microscopically lifting the skin. The tape also has a recoil effect influencing the position and dispensability of the skin. Convolutions, small grooves caused by coiling of the tape, will appear depending on

mobility of the underlying tissue and the space created by these convolutions will affect the underlying muscle function.⁹ The tape is claimed to effect the five major physiological systems: skin, fascia, circulatory/lymphatic, muscle, and joint, and can be useful in all populations, for all injuries. However, there is not enough evidence to widely support these claims. Each of the five physiological systems identified by Dr. Kase has a tape application procedure specific to it.⁹ The current research will utilize techniques that are aimed to address the circulatory/lymphatic systems and muscle facilitation, in order to explore the above stated claims.

Common Mechanism of Injury (MOI)

In speaking of and investigating injury to the ankle, one must understand the anatomy of the region, as well as how the injury occurs and presents itself. The ankle is comprised of three different articulations: the inferior tibiofibular joint, the talocrural joint, and the subtalar joint (Figure 1). The inferior tibiofibular joint is formed by the distal end of the fibula, as well as the distal end of the tibia. This joint is supported and held together by a very strong interosseous membrane which distally forms the tibiofibular, or syndesmotic, ligaments. The talocrural joint is commonly referred to as the ankle or the ankle mortise. This joint is formed by several parts; the facet on the distal end of the tibia articulating with the superior surface of the talus, the medial malleolus

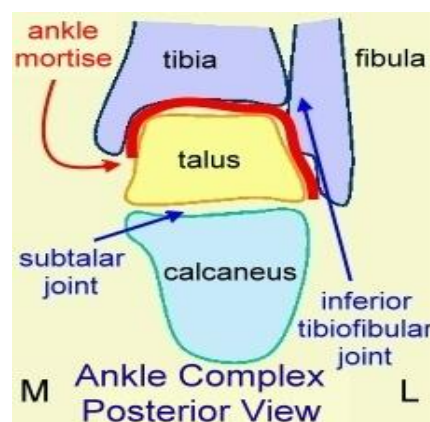


Figure 1. The Ankle Joint Complex
(www.pt.ntu.edu.tw/hmchai/Kinesiology/KINlower/AnkleStructure.htm.)

articulating with the trochlea of the talus, and the lateral malleolus articulating with the lateral part of the trochlea. This joint provides the motions of plantar and dorsiflexion of the foot. Lastly, the subtalar joint is formed by the articulation between the talus and the calcaneus, and is where the motions of inversion, eversion, pronation and supination occur.¹⁰

The actions occurring at each of the joints are stabilized by ligaments dispersed around the area. The tibiofibular ligaments (or interosseous membrane), between the tibia and fibula help to diffuse forces placed on the leg. The ankle is further supported by three lateral ligaments: the anterior talofibular which restrains anterior displacement of the talus, the posterior talofibular that restrains posterior displacement of the talus, and the calcaneofibular which resists calcaneal inversion (Figure 2).¹⁰ The medial ligamentous support is provided by the deltoid ligament which restrains against eversion of the ankle and subtalar joint, and also prevents eversion, pronation and anterior displacement of the

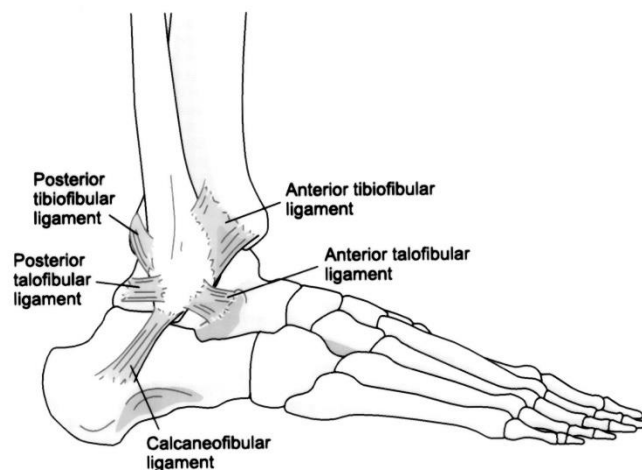


Figure 2. Lateral Structures of the Ankle.
(www.peakphysicaltherapy.net/pain-locator-foot-ankle.)

talus.¹⁰

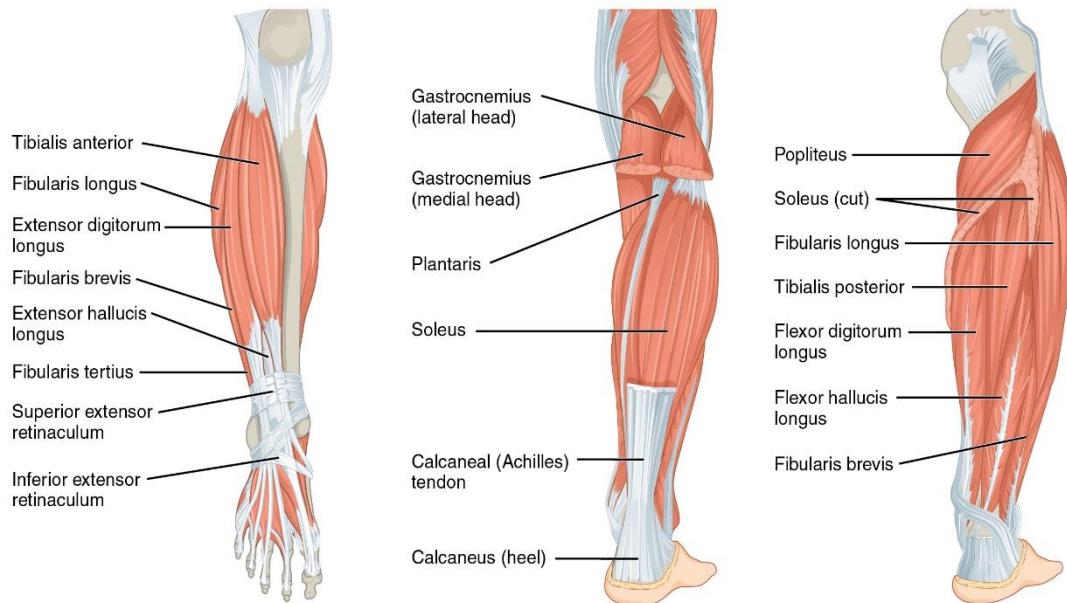
Actions of musculature surrounding the area are important in further understanding the musculoskeletal components of the ankle. The anterior compartment of the leg consists of four different muscles acting on the region (Figure 3). The tibialis anterior dorsiflexes and inverts the foot, as does the extensor hallucis longus which also extends the great toe.¹⁰ The extensor digitorum longus dorsiflexes and everts the foot and extends the toes.¹⁰ Also responsible for dorsiflexion, the fibularis tertius additionally everts the foot.¹⁰ The lateral compartment consist of the fibularis longus and fibularis brevis that both plantar flex and evert the foot.¹⁰ Furthermore, the superficial posterior compartment consist of the gastrocnemius, soleus, and plantaris all of which plantar flex the foot.¹⁰ The gastrocnemius and plantaris however, also play a role in flexion of the knee. Lastly, the deep posterior compartment is comprised of the popliteus, flexor

Figure 3. Muscles of the Lower Leg

(www.cnx.org/contents/cbdf00f-2ef8-4348-9111-9fd4ba7a02c5@3)

hallucis longus, flexor digitorum longus and tibialis posterior.¹⁰ The popliteus muscle is responsible for knee flexion and medial (internal) rotation of the lower leg.¹⁰ The flexor hallucis longus, flexor digitorum longus and tibialis posterior all plantar flex and invert

the foot, with the flexor hallucis longus and flexor digitorum longus additionally flexing the toes.¹⁰



The mechanism of injury will help in determining the bony structures and soft tissues that have specifically been injured during an ankle sprain. An inversion ankle sprain involves the lateral ligamentous structures of the ankle. The anterior talofibular ligament is injured when the foot is in an inverted, plantarflexed, and internally rotated which is common in sports like soccer, basketball and football.¹⁰ As the amount of inversion force is increased, the calcaneofibular and posterior talofibular ligaments may then become compromised.¹⁰

A sprain can be classified into one of three grades depending on how severely the lateral ligaments have been compromised. A grade 1 ankle sprain stretches the ligaments involved (likely 2 of the 3).¹¹ The next progression is a grade 2 ankle sprain in which the ligaments have been partially torn.¹¹ If the ligaments have been completely torn, the sprain will be classified as grade 3.¹¹ The symptoms that the patient presents with will be progressively more severe. A grade 1 ankle sprain will present with mild swelling, point

tenderness, and minimal pain that does not prevent weight bearing (walking). A grade 2 ankle sprain will present similarly only in this case, pain may cause a slightly altered gait pattern. Finally a grade 3 ankle sprain presents with the previously mentioned symptoms, however weight bearing will not be possible.¹¹

Pain

Regardless of the severity of the lateral ankle sprain, mild to severe pain may be experienced by the patient. Typically however, the pain experienced increases with the severity of the injury, although this depends on each individual. A suspected reason that the effects of Kinesio Tape on pain have often been investigated is that there is a high occurrence of pain with injury. Kinesio Tape may be used for a variety of different injuries in many different areas of the body. Zajt-Kwiatkowska et al⁴ performed a study on the effects of Kinesio Tape on a number of different sports injuries. The investigators specifically looked at five different injuries on five different athletes; one of these injuries was an ankle sprain and the rest were conditions concerning the biceps brachii, the lower leg and the plantar surface of the foot.⁴ The ankle sprains that had the Kinesio Tape applied were not complete ligament ruptures and the individual had complete ankle stability.⁴ To measure pain, the investigators used their own subjective findings obtained by statements in response to investigator questions concerning pain; there was no measurement tool used such as a scale.⁴ In their results, Kinesio Tape decreased the level of pain experienced by the patients. Their results supported another study where the Kinesio Tape was applied for ten to twelve weeks on a knee injury.⁴

Furthermore, Burke¹² had similar findings in that the application of Kinesio Tape eliminated or decreased pain symptoms in athletes. Burke¹² performed a study during the

AIDS bicycle ride in California. The ride was 500 miles long, lasting 7 days and spanning from San Francisco to Los Angeles. There were 14 participants in total, 7 of whom suffered from Achilles tendonitis and the other 7 suffered from patellar tendonitis.¹² During the ride, a physical therapist who had taken Kinesio Taping 1 and Kinesio Taping 2 courses, applied Kinesio tape to each of the participants before the ride began or during the ride if a rider had stopped with pain complaints. Pain was measured prior to the application and then again right after. Each of the participants showed a significant decrease in pain symptoms and were able to resume and complete their bike race.¹² Nosaka¹³ examined pain caused by over-use and too much exercise. He described the effects of the tape on delayed onset muscle soreness in 12 male individuals who never resistance trained. The individuals performed an eccentric resistance exercise on a modified arm curl machine, with each repetition lasting 3 seconds. Repetitions were repeated every 15 seconds for 24 sets.¹³ There were two testing sessions, each lasting 5 days with two weeks between sessions. During the first session, the group was split in half, one half received Kinesio Tape on the biceps and the upper arm and the other half of the group received no treatment. The groups then switched for the second session where the same arm was tested. No information was given to the individuals on what Kinesio Tape may do in order to eliminate a placebo effect.¹³ During each session the investigator measured the following factors while the patient performed flexion and extension of the elbow: maximal isometric force at the elbow, ROM of the elbow, circumference in different spots of the upper arm, plasma levels of creatine kinase and pain using a pain scale.¹³ The data showed less pain in both flexion and extension with Kinesio Tape

compared to the no-tape condition. Their findings suggested that Kinesio Tape controlled muscle damage and helped in the overall recovery of the muscle.¹³

In an investigative study on the efficacy of Kinesio Tape (KT) for shoulder pain, Thelen et al¹⁴ compared the short term effects of Kinesio Tape application to a sham Kinesio Tape application on reducing shoulder pain (tendonitis/impingement) and pain related disability.¹⁴ There were 42 participants who were split into two groups, one received Kinesio Tape according to guidelines by Dr. Kase and one received the Kinesio Tape sham method. All tape was applied by a certified KT practitioner who completed 3 courses and was granted certification from Dr. Kase's organization. All measurements were taken using a goniometer.¹⁴ Measurements were taken at baseline before tape application, immediately after tape application, 3 days later and 6 days later. Active range of motion (ROM) was defined as the range of active motion attained at the point of first onset of pain. Once this point was reached, the visual analog scale (a tool used to objectively measure pain) was used to record the intensity of the pain at that point.¹⁴ At 3 days after application, the subjects were reassessed and new tape was applied with the same technique. Final measures were recorded 6 days after application. Data showed the KT sham group had no change in ROM while the KT group showed a significant improvement in abduction ROM. Both groups significantly improved in both outcome measures by day 6.¹⁴ These results showed the positive effect Kinesio Tape may have immediately after application; they also support the idea and the need for more research to investigate Kinesio Tape between the last application at 3 days, and last data collection session at 6 days after application.

Similarly, Merino-Marban et al¹⁵ looked at the effect of Kinesio Tape on pain and ROM. They investigated the immediate effects of Kinesio Tape on calf pain and ankle ROM in athletes who participated in an event consisting of running, cycling, and then running again (called duathletes).¹⁵ A total of 28 athletes were recruited before the race began and were included after confirming that they did not have any musculoskeletal disorders.¹⁵ The Numerical Pain Rating Scale was used to record the patients' perceived level of calf muscle pain while ankle dorsiflexion was measured using an inclinometer in a weight bearing position. All measurements and Kinesio Tape application were taken by the same investigator. The tape was applied to one leg which was randomly selected on each of the participants.¹⁵ Measurements were taken prior to Kinesio Tape application, immediately after Kinesio Tape application and immediately after competition. Data indicated that Kinesio Tape had a significant positive effect on ankle ROM immediately after application but not after completion of the race.¹⁵ Although there was increased pain after the race in some circumstances, the increased pain was greater in the leg not receiving intervention than it was in the leg that received Kinesio Tape application. The investigators concluded that application of Kinesio Tape had immediate but not long term effects on ankle dorsiflexion ROM. It also did not seem to affect pain immediately after application but did have a long term effect on the amount of pain experienced after competition.¹⁵ These results pose a great need for further research; although the tape did not positively affect ROM or pain immediately after competition, it may affect an ankle that has just experienced trauma. The current study will aim to add evidence to this area of research.

Also examining the effects of Kinesio Tape on pain was Aytar et al¹⁶ in their study on patellofemoral pain syndrome. Their research may pose a new way to treat pain with musculoskeletal injuries. They used a physical therapist to apply Kinesio Tape in a Y-shaped manner over the quadriceps muscle as directed by Dr. Kenzo Kase.¹⁶ A clinically accepted valid measurement tool called the visual analog scale (according to Aytar et al¹⁶), was used to measure pain intensity experienced throughout functional movement among the subjects. The subjects were instructed to put a dash mark on the area of the line that best represented their pain intensity.¹⁶ Data were collected while the patients were walking in a straight line, going down stairs as well as going up stairs.¹⁶ Results indicated no significant differences in pain between their Kinesio taped patients and their Kinesio placebo taped patients. The investigators pointed out that the application of Kinesio Tape may be able to stimulate cutaneous receptors but not able to stimulate the receptors enough to employ the gate control theory of pain, meaning that tape application does not have enough of an effect to stimulate the cutaneous receptors and their A β afferent pathways to inhibit the pain receptors, or nociceptors, and their A δ and C afferent fibers.¹⁰ As stated in the gate control theory, if the cutaneous receptors were stimulated enough, their A β afferent pathways would override the pain signal from the A δ and C afferent fibers in the dorsal horn.¹⁰ Therefore, the pain information from the nociceptors would be blocked by the cutaneous receptors and the individual would no longer experience pain.¹⁰ For this reason, Kinesio Tape may not decrease pain in the knee.

The change in the amount of pain that individuals experienced with Kinesio Tape application is inconclusive from research. When the tape was applied to five different

injuries, the results showed a decrease in pain that was subjectively measured.⁴ For patellofemoral pain syndrome, Kinesio Tape application gave contradictory findings and showed no significant change in pain assessed using a visual analog scale.¹⁶

Contradicting results and varied subjective assessments of pain, give great reason for conducting a research study that further examines the effects of Kinesio Tape on pain.

Range of Motion

According to the Washington Department of Social and Health Sciences, a normal non-injured ankle will have approximately 30° of inversion.¹⁸ This range of motion, after injury, will likely be decreased due to protective mechanisms, like muscle guarding, taking place within the body. The basis of all functional movements that athletes endure is both possible and limited due to the range of motion that occurs at each joint.

Throughout the gathering and review of articles on the effects of Kinesio Tape, functional movement and performance was often seen as an investigated outcome measurement. The functional movement screen was used in a study that focused on the lower extremity and Kinesio Tape use.¹⁹ The functional movement screen assesses an individual's symmetry of motion and risk of injury by examining the stability and mobility of their body during seven different motions. Hyun Mo et al¹⁹ used this method and compared results of a healthy control group (n=16) with no tape to the results of a healthy treatment group that had Kinesio Tape applied at different lower extremity points bilaterally. These points included the sartorius, rectus femoris, hamstrings, tibialis anterior, fibularis brevis and the patella.¹⁹ They found no difference in ROM between their Kinesio Tape and no-tape conditions during the deep squat test of the FMS. On the contrary, the statistical results of the hurdle-step on both the left and right sides showed a

significant improvement in the Kinesio Tape condition versus the no-tape condition.¹⁹ Hyun Mo et al¹⁹ suggested that Kinesio Tape had the greatest benefit for joints that are non-weight bearing in the motion; the results on weight bearing joints however, were inconclusive.¹⁹

Another study that examined functional movement looked at the effects of a semi-rigid ankle stabilizer on individuals that had non acute ankle sprains that were mechanically stable but not functional.²⁰ There were 25 subjects, a majority female (8 male, 17 female), diagnosed with ankle sprains 3-4 weeks prior to participation but medically cleared for activities of daily living.²⁰ Each of the subjects were mechanically stable as cleared by a physician but were deemed functionally impaired using the Romberg test.²⁰ The authors examined if the semi rigid stabilizer affected the patients' ankle stability, using one pretest and 2 testing sessions in which the ankle stabilizer was worn. The subjects completed a timed 36.58m shuttle-run and a vertical jump test during each testing session.²⁰ Scores were significantly improved in the shuttle-run when the subjects wore an ankle stabilizer.²⁰ A third study examined 51 male athletes all of whom participated in soccer, basketball or team handball premier-league teams in Iceland.⁷ This study examined the effects of KT tape, elastic tape and no tape on muscle activity in the athletes during an inversion thrust produced by a brick being dropped on a balance board. The thrust caused the individual's ankle to go into inversion.⁷ Muscle activity was collected with electromyography (EMG) from muscles that would help prevent ankle sprains under these conditions. Mean muscle activation and peak muscle activation were analyzed. There were no significant differences in mean muscle activation scores or peak muscle activation scores among each of the taping conditions.⁷

In these three articles, the effects of KT tape on functional performance were inconclusive. In one study, the results showed that only the non-weight bearing component out of the seven exercises showed improvement with the KT tape applied.¹⁹ On the contrary, two other studies found no significant effects from the application of Kinesio Tape on their variables.²⁰ Each of these studies provide significant information in relation to functional movements after an ankle sprain but do not quantify the active eversion range of motion at the ankle.

Further research provided by Murray²¹ investigated the effects of Kinesio Taping on muscle strength and ROM in the quadriceps femoris, hamstring and anterior tibialis muscles in individuals with recent anterior cruciate ligament (ACL) reconstruction.²¹ Two individuals volunteered for the research. EMG recording electrodes were placed on the skin over anterior and posterior thigh muscles, and the anterior leg compartment muscles. Patients performed four full active knee extensions while the EMG recordings were taken. On a fifth repetition knee ROM was measured with a goniometer.²¹ These measurements were taken during three conditions: no tape, athletic tape and Kinesio Tape which was applied using Dr. Kase's method.²¹ There was no difference in range of motion between the no tape and athletic tape conditions in the lack of normal active extension, or extensor lag, but there was an improvement in active ROM in the Kinesio Tape condition.²¹ EMG measurements showed no difference between the no tape and athletic tape condition but an immediate increase in muscle activation amplitude under the Kinesio Tape condition.²¹ The application of such information to this study is extremely important. Murray's²¹ findings provide specific information on ROM of a

joint. However, with such a small sample, and no supportive research, evidence is limited on how Kinesio Tape affects ROM in different joints.

The studies that examined the effects of Kinesio Tape on functional performance have used different functional movements, performance screens or functional movement screens. Range of motion in the joint being examined will affect functional movement patterns. It is important to examine the ROM in a sprained ankle in order to completely assess the integrity and stability of the joint. There is no study to our knowledge that examines the effect of Kinesio Tape on the range of motion in an ankle sprain through use of active or passive range of motion assessment over time. This study plans to add evidence to the current research on how Kinesio Tape affects active ankle range of motion.

Effusion

One of the body's first reactions to soft tissue injury is the inflammatory response which can occur minutes to hours after initial injury. Although this inflammation is part of the body's protective response, the inflammation does not provide an optimal environment for healing. The standard protocol for the treatment and reduction of edema is PRICE; protection, rest, ice, compression and elevation. The current research on Kinesio Tapes' effects on effusion after an ankle sprain is very limited. One study that examined the effects on effusion used Kinesio Tape on both the ankle and three other acute injuries.⁴ Seven patients participated and all were suffering with acute injuries or chronic pain caused by participation in sport activities or sport training. The authors used a physical therapist to apply the tape to the injury sites and left the tape on for four to six days. Injuries included an ankle sprain, tennis elbow, inflammation of the long head of

the biceps femoris, anterior and lateral compartment syndrome, and inflammation of the plantar aponeurosis. The authors' recorded observations; observations showed a visible decrease in edema.⁴

Man et al²² conducted a study consisting of 34 participants, 11 female and 23 male, who all were recovering from acute (within 5 days of testing) ankle sprains. The subjects were placed into three groups: one application of neuromuscular electrical stimulation applied to the lower leg muscles, one with submotor electrical stimulation applied to the lower leg muscles and one with no electrical stimulation.²² Each subject underwent volumetric testing, and figure eight girth measurements of their affected ankle and completed the Hughston Clinic Subjective Rating Scale for Ankle Disorders.²² The electrical stimulation intervention followed based on their assigned group. After the intervention, the same measurements were re-taken. Results showed that the Hughston Scores were significantly different between the first and last treatments in all three groups but not among the groups. This indicated that the patients pre-injury functional status was better for all interventions when the first and last sessions were compared. There were no significant differences between the three groups in volumetric measurements or girth measurements from pre to post testing.²² These findings suggest that these treatment options may not be the best choice in the treatment of edema for an acute ankle sprain. Kinesio Tape should be investigated as a possible treatment option for decreasing edema during an acute ankle sprain.

On the contrary, Bialoszewski⁸ found a significant decrease in edema after Kinesio Tape application with their participants. The goal of their research was to examine the Kinesio Tape lymphatic tape application technique on patients undergoing

limb lengthening.⁸ Participants were randomized into a study group and control group if they had developed edema from the limb lengthening treatment. The study group consisted of 12 individuals who each had Kinesio Tape applied in four strips without any tensing.⁸ Measurements of circumference of the treated limb and the healthy limb were taken both before and after the Kinesio Tape application. Each measurement was taken 5 times at which point the two extremes were eliminated and the average of the remaining 3 was recorded.⁸ Patients who received Kinesio Tape application and patients who did not, both experienced a decrease in edema.⁸

This research demonstrates inconsistency throughout the treatment of effusion with Kinesio Tape in injuries. Few studies focused primarily on the ankle itself. Of those that did, one showed no significant effect of electrical stimulation, and the other relied upon visual observation versus physical measurements of effusion. None of the current research used Kinesio Tape as a treatment for traumatic injury with effusion, particularly the ankle. Such limited evidence on the influence of Kinesio Tape on effusion in ankle sprains justifies measurements in the current study.

Summary

As can be seen in the research provided above there has been conflicting evidence established about the effects of Kinesio Tape on injuries and the rehabilitation process. In the evidence produced, a standing lack of agreement is apparent. Ankle sprains are one of the most common injuries in sport and therefore the rehabilitation of them should be studied thoroughly. When new treatments and rehabilitation aids surface, they must be investigated to see if they can effectively and efficiently aid the healing process. Collegiate athletes are pressed to return to play, and therefore a treatment that can

decrease effusion and pain and increase ROM efficiently may be very useful. It is claimed that Kinesio Tape can do exactly that, through eliciting small changes at the subdermal level to better filter out lymph that causes swelling⁴. However, the claims of the effects of Kinesio Tape on pain and ROM are inconclusive in research. This study will attempt to quantify the effects of Kinesio Tape on effusion and pain levels in grade 2 inversion ankle sprains of collegiate athletes.

Methods

Participants

The participants in this study were Division III varsity collegiate athletes, ranging from freshman to seniors. Recruitment included individuals with ankle sprains however due to lack of injury occurrence, the focus was changed to knees. Each athlete that was included suffered from patella related knee conditions as assessed by the referring Certified Athletic Trainer (ATC). The exclusion criteria included athletes who did not participate in a varsity sport (such as club or recreational sports) and athletes who were sensitive to adhesives, allergic to tape as activated by friction/heat, or disliked things on their skin. The Institutional Review Board at Bridgewater State University approved this

research and all participants signed a consent form (Appendix A). This research was also approved by Kinesio Tex Tape IRB (Appendix B), which provided an in-kind contribution of tape.

Instruments

Two different instruments were used to measure each of the outcomes. The visual analog scale (VAS) was used to measure pain (Figure 4). The scale is 10 cm in length and ranges from no pain to worst possible pain. In order to measure any effusion present within the knee, a measuring tape was used. We planned to assess range of motion but since the injury type and length of the protocol was changed this measurement was dropped. The person applying the Kinesio Tape was trained via KinesioTex Tape videos and seminar resources.

Visual Analog Scale

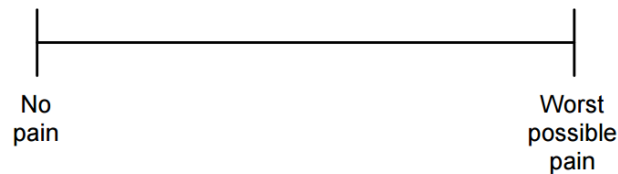


Figure 4. Visual Analog Scale

Procedures

Certified Athletic Trainers at Bridgewater State University identified athletes with knee injuries/conditions that included patella related issues. After gaining the athletes permission the ATC sent a list of these individuals and their contact information to the

study's co-investigator. With this information, the study's co-investigator sent an e-mail (Appendix C) that provided a brief explanation of the study and set up a meeting to explain further detail and completed the informed consent process. During the initial meeting the informed consent was reviewed. All athletes agreed to participate, the form was signed by both athlete and study co-investigator and a second meeting time was scheduled.

During the second session, the study co-investigator confirmed that the patient had no allergies, and asked the athlete to fill-out a pre-intervention questionnaire (Appendix D). The athlete used the VAS to indicate their level of pain. They were instructed that the line on the page represented their level of pain, from no pain to worst possible pain, and they were to put a mark along that line which was representative of the pain they were feeling. After the athlete completed the pain measurement scale, they sat on the treatment table with their knees in a relaxed extended position, heels on the table surface. In that position, the study co-investigator palpated the tibial tuberosity and the apex of the patella and noted the point half way between each along the patellar tendon. The study co-investigator then used a measuring tape and took the circumference of the knee at that half way point. The measurement was entered in an excel spreadsheet on the co-investigators' computer under a password protected excel document. The co-investigator repeated the same measurement and recording process on the athlete's unaffected knee.



Figure 5. Kinesio Tape Application
<https://www.youtube.com/watch?v=nipqXBLkLuo>

After girth measurements were completed, the athlete assumed a short-seated position at the end of the treatment table. The tibial tuberosity was palpated and marked, as was half way up the athlete's anterior thigh, along the rectus femoris. The Kinesio Tape application to address patella tracking and pain was then prepared.²³ A piece of KinesioTex Tape was measured and cut to that length and then applied with zero stretch from the tibial tuberosity to the point marked half way up the anterior thigh. A second piece of tape was cut at the same length and then cut in half length-wise forming two tails. This piece of tape was applied 1 inch below the tibial tuberosity with zero stretch and extended up the anterior thigh, separating the two tails along the medial and lateral borders of the patella and continuing along the anterior and medial side of the existing piece of tape. The two pieces of tape were rubbed in a quick back and forth motion with the co-investigators hands to cause friction and heat. This process activated the tapes' adhesive. Lastly, a third piece of tape was cut 3 squares in length and applied with 25%

stretch over the patella tendon in a horizontal position. This piece of tape was activated with friction the same way as the previous two pieces.

Immediately after tape application another girth measurement was taken and recorded in the password protected excel spreadsheet. The athlete was instructed to notify the study co-investigator if the tape became bothersome for any reason. The investigator scheduled a second meeting with the athlete for 36 hours after the tape application. Once this meeting was scheduled, the athlete was free to go about their normal daily routine, including any rehabilitative exercises that their ATC had scheduled for them.

At the final meeting 36 hours after tape application the athlete completed the VAS to indicate pain and a final girth measurement was taken of both the affected and unaffected knee. All data were recorded in the password protected excel spreadsheet and that athletes' participation was complete.

Results

Participants

The original purpose of this study was to investigate ankle sprains, however that changed due to the lack of ankle injuries among the selected population. In order to keep the focus on a weight bearing joint while still having enough participants, the investigators chose to focus on the knee. Four participants were recruited with similar (patella related) knee conditions, one was dropped from the data collection for lack of compliance with the 36 hour time frame. All other participants (n=3) were compliant with the study protocol. Table 1 includes all demographic information collected during a pre-intervention questionnaire (Appendix D). Notice that of three participants, only one is male. This same individual is the only participant that took part in both a varsity and club sport. Also note that patient 1 has a history of traumatic knee injury involving her MCL; her patella related pain began during rehabilitation of her MCL. Patients 1 and 3 had never heard of Kinesio Tape before. All 3 participants believed in alternative forms of medicine.

Patient	Class Standing	Sex	Sports	Weekly Participation (Hours)	Previous Injury	Knee Injured
1	Freshman	Female	Softball	12	Right Knee-Traumatic	Right
2	Freshman	Female	Women's Lacrosse	12	Bilateral Knee-Overuse Right Foot-Traumatic	Left
3	Senior	Male	Football Men's Lacrosse	9 12	Left Tibia-Traumatic	Right

Table 1. Participant Demographics

Pain Measurements

Pain measurements are presented in Table 2. All three participants showed a decrease in pain. A higher number indicated a pain level close to the “worst possible pain” and a lower number indicated a pain level close to “no pain”. The greatest absolute difference was seen with patient 3. Patients 1 and 2 both experienced similar absolute differences in their pre and post VAS measurements. Patients 1 and 3 also experienced similar relative change in pain, both in the 50% range. Patient 2 experienced the greatest amount of relative change in pain.

Table 2. Pre and Post Pain Assessment

Patient	VAS Pre (cm)	VAS Post (cm)	Absolute Change (cm)	Percent change
1	2.4	1.1	-1.3	54
2	1.6	0	-1.6	100
3	8.3	3.6	-4.7	57

Girth Measurements

Tables 3 and 4 both present girth measurements in relation to time. In Table 3 you can see that two participants increased in girth measurements immediately after tape application. Table 4 shows measurements taken on both the patients’ affected and unaffected sides, before and after 36 hours of tape application. Decreases in girth occurred in all patients on the affected side. All patients percent change decreased at 36 hours. The unaffected side of all patients stayed the same, increased or decreased in girth.

Table 3- Girth Measurements Pre and Post Application

Patient	Pre Application Girth (Affected) (cm)	Post Application Girth (Affected)(cm)
1	43.4	43.4
2	33.6	33.7
3	36.1	36.7

Table 4. Girth Measurements Pre and Post Intervention

Patient	Pre Affected Girth (cm)	Post Intervention Affected Girth (cm)	Percent Change	Pre Unaffected Girth (cm)	Post Intervention Unaffected Girth (cm)	Percent Change
1	43.4	43.1	-0.7	42.0	43.3	3.0
2	33.6	33.5	-0.3	34.5	34.5	0
3	36.1	35.6	1.4	36.5	36.4	0.3

Discussion

The purpose of this study was to investigate the effects of KinesioTex Tape on pain and effusion in patella related knee conditions in Division III collegiate athletes. It was hypothesized that the application of Kinesio Tape would help decrease pain and any swelling associated with patella related knee conditions in collegiate athletes. The findings from this study help add evidence to the little literature available on the use of Kinesio Tape as a treatment tool.

Pain Measurements

The Visual Analog Scale (VAS) was used to measure the level of pain experienced by the athlete. As can be seen in Table 2, all patients expressed a decrease in pain overtime during a 36 hour period. Each patient's relative change decreased indicating their pain levels dropped from mid range to low range when viewed on the VAS. These findings were expected as it was hypothesized that the tape application would decrease pain amongst participants.

The decrease in pain shown in these data, is similar to the results seen by Lan et al.²⁴ Their research showed a significant decrease in pain after tape application to individuals with patellofemoral pain syndrome. The VAS was used with all 100 patients to assess their level of pain and any difference of greater than 20 mm was said to be significant. This cohort study was much larger than the current study and it supports our findings. The range of VAS score changes in this study was 13 to 47mm. Further supporting our results were the findings of Freedman et al²⁵ in their work investigating KT tape on 49 patients with pain from patellofemoral pain syndrome. Their results showed a significant decrease in pain for those patients with the tape application. This

application was similar to the application in this study however it did not include the pieces of tape to address patella tracking. On the contrary, recent studies show no clinically significant difference in pain scores between KT tape and no tape conditions.^{25,26} The supportive research showed that not all injury locations, especially in non-weight bearing joints, respond with a decrease in pain with KT tape. Our findings suggest that KinesioTex Tape may be useful for decreasing pain in patella related knee conditions.

Because our sample was small, we did not do any statistical analysis, but it can clearly be seen that pain decreased for all 3 participants. Each of the participants suffered from chronic patella pain and was participating in standard rehabilitation at the time of Kinesio Tex Tape intervention. Because the injuries were not acute, we cannot say or infer what the normal healing process would be and in what time frame normal pain free activity could take place. Thus we are not able to differentiate if the decrease in pain over 36 hours was directly due to KinesoTex Tape application, the patient's rehabilitative exercises, or both interventions. However, it appeared that the KinesioTex Tape played a role in decreasing patients' pain levels during the time of intervention.

Girth Measurements

Our results from pre application to immediate post application were likely increased or the same due to the methods used for measurement; the measurement was taken over the area of tape application. For this reason, we cannot conclude that the tape immediately influenced swelling. However after 36 hours of intervention with Kinesio Tape, there was a small relative decrease in girth measurements for all three participants.

Our data findings were similar to those seen in recent research. Nunes et al²⁶ found no significant decrease in swelling in their investigation of KinesioTex Tape use for lymphatic drainage of ankle sprains. Although our study did not investigate ankle sprains, it is one of the two other weight bearing joints. Zajt-Kwiatkowska et al⁴ found a decrease in inflammation (measurement method not mentioned) of a biceps tendonitis, lower leg syndrome and plantar aponerosis with application of KinesioTex Tape. They did not state whether their measurements were found to be significant, however their findings support ours in that KinesioTex Tape may help slightly decrease swelling in conditions of tendonitis and in weight bearing joints.

Additionally, in comparing the affected knee to the unaffected knee pre and post 36 hour intervention, results were not conclusive. Post 36 hour intervention the affected knee decreased by a small amount for all 3 subjects, but the unaffected knee responded differently for all 3 participants. It is possible that the athlete's normal rehabilitation decreased swelling for the affected knee and the KinesioTex Tape helped with the process.

Although our sample size was significantly small, our results provided positive feedback to our participants and the sports medicine field. We can say that the KinesioTex Tape decreased pain in all participants and that it also slightly decreased swelling. This information can be applied to our field when considering the use of KinesioTex Tape in the treatment of pain and swelling. The tape most impacted the patients' pain levels.

Limitations

One of the most significant limitations to this study was the absence of a control group. There would be a better explanation of girth and pain measurement changes with a KinesioTex Tape intervention if there was a control group. Furthermore, the sample size was very small. Additionally, the time restraints for the study timeline did not allow for the tape to be applied for longer than 2 days, different results may have been seen if the tape was able to be left on the patient for a longer period of time.

Future Studies

Further research must investigate the effects of KinesioTex Tape on pain and effusion over a longer period of time and in comparison to a control group. Studies should also aim to further quantify pain, swelling and ROM responses to KinesioTex Tape. It is important for future research to add evidence regarding the significant effects of KinesioTex Tape, so that sports medicine practitioners can determine if it is an effective treatment option. Also, additional research should expand the population to athletes of all levels and the general population.

References

1. Terada M, Pietrosimone B, Gribble P. Therapeutic interventions for increasing ankle dorsiflexion after ankle sprain: a systematic review. *Journal of Athletic Training* [serial online]. September 2013;48(5):696-709. Available from: MEDLINE, Ipswich, MA. Accessed December 5th, 2013.
2. Guillodo Y, Simon T, Le Goff A, Saraux A. Interest of rehabilitation in healing and preventing recurrence of ankle sprains. *Annals of Physical and Rehabilitation Medicine*. 2013; 56: 503-514.
3. Hubbard T, Wikstrom E. Ankle sprain: pathophysiology, predisposing factors, and management strategies. *Open Access Journal of Sports Medicine*[serial online]. July 16, 2010;1:115-122. Available from: MEDLINE, Ipswich, MA. Accessed December 5th, 2013.
4. Zajt-Kwiatkowska J, Rajkowka-Labon E, Skrobot W, Bakula S, Szamotulska J. Application of kinesiio taping for treatment of sports injuries. *Research Yearbook*. 2007;13(1), 130-134.
5. Kase K, Hashimoto T. Changes in the volume of the peripheral blood flow by using kinesiio taping. 1998; <http://www.kinesiotaping.com/research/published-research/18-category-association-case-studies-1998>. Accessed March 12, 2014.
6. Mayo Clinic. Doppler-ultrasound: What is it used for?[WebPage]. Mayo Foundation for Education and Research. <http://www.mayoclinic.org/doppler-ultrasound/expert-answers/faq-20058452>. Accessed May 31, 2014.
7. Briem K, Eythorosdottir H, Magnusdottir RG, Palmarsson R, Runarsdottir T, Sveinsson T. Effects of kinesiio tape compared with nonelastic sports tape and the untaped ankle during a sudden inversion perturbation in male athletes. *Journal of Orthopaedic & Sports Physical Therapy*. 2011; 41(5): 328-335.
8. Bialoszewski D, Wozniak W, Zarek S. Clinical efficacy of kinesiology taping in reducing edema of the lower limbs in patients treated with the Ilizarov Method- Preliminary report. *Ortopedia Traumatologia Rehabilitacja*. 2009; 11(6): 46-54.
9. Kinesiio Taping Association International. *KTI: Fundamental Concepts of the Kinesiio Taping Method*. Albuquerque, NM. Kinesiio IP, LLC; 2011.
10. Prentice, W. *Principles of Athletic Training: A Competency Based Approach*. 15th ed. New York, NY: McGraw-Hill; 2014:278,535-540.

11. Corey E. UNC Sports Medicine and Family Medicine. *Lateral Ankle Sprains*. Chapel Hill, NC; April, 2010. http://www.med.unc.edu/fammed/fammedcenter/about-us/services/sportsmedicine/Ankle_Strengthening_handout.pdf. Accessed May 29, 2014.
12. Burke W. The effects of kinesiio taping on pain from patellar and Achilles tendonitis in bicyclists. 2005; <http://www.kinesiotaping.com/research/published-research/25-category-association-case-studies-2005/145-the-effects-of-kinesio-tapingr-on-pain-from-patellar-and-achilles-tendonitis>. Accessed March 12, 2014.
13. Nosaka K. The effect of kinesiio taping on muscular micro-damage following eccentric exercises. *15th Annual Kinesio Taping International Symposium Review*. 1999; (p. 70-73) Tokyo, Japan: Kinesio Taping Association.
14. Thelen M, Dauber J, Stoneman P. The clinical efficacy of kinesiio tape for shoulder pain: A randomized, double-blinded, clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*. 2008; 38(7): 389-395.
15. Merino-Marban R, Mayorga-Vega D, Fernandez-Rodriguez E. Effect of kinesiio tape application on calf pain and ankle range of motion in duathletes. *Journal of Human Kinetics*. 2013; 37: 129-135.
16. Aytar A, Ozunlu N, Surenkok O, Baltaci G, Oztop P, Karatas M. Initial effects of kinesiio® taping in patients with patellofemoral pain syndrome: A randomized, double-blind study. *Isokinetics & Exercise Science*. 2011; 19(2): 135-142.
17. Price D, McGratch P, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain*. November 19th, 1982; 17: 45-56. <http://www.mvclinic.es/wp-content/uploads/Price-et-al-83-Validation-VAS-pain.pdf>. Accessed May 31st, 2014.
18. Washington Department of Social and Health Services. *Range of Joint Motion Evaluation Chart*. Washington State. August 2002. http://www.dshs.wa.gov/pdf/ms/forms/13_585a.pdf. Accessed May 31, 2014.
19. Hyun Mo A, Miller C, Mcelveen, M, Lynch J. The effect of kinesiio tape® on lower extremity functional movement screen™ scores. *International Journal of Exercise Science*. 2012; 5(3): 196-204.
20. Hals TM, Sitler MR, Mattacola CG. Effect of a semi-rigid ankle stabilizer on performance in persons with functional ankle instability. *The Journal of Orthopaedic and Sports Physical Therapy*. 2000; 30(9): 552-556.

21. Murray H. Kinesio taping, muscle strength and ROM after ACL repair. *Journal of Orthopedic and Sports Physical Therapy*. 2000; 30: 1.
<http://www.kinesiotaping.com/research/published-research/20-category-association-case-studies-2000/115-effects-of-kinesio-taping-on-muscle-strength-after-acl-repair>. Accessed March 12, 2014.
22. Man IOW, Morrissey MC, Cywinski JK. Effect of neuromuscular electrical stimulation on ankle swelling in the early period after ankle sprain. *Physical Therapy*. 2007; 87(1): 53-65.
23. OfficialKinesio. Kinesio Precut Knee Application [Video]. YouTube.
<https://www.youtube.com/watch?v=nipqXBLkLuo>. Published August 16, 2011.
Accessed January 21, 2015.
24. Lan TY, Lin WP, Jiang CC, Chiang H. Immediate effects and predictors of effectiveness of taping for patellofemoral pain syndrome: a prospective cohort study. *American Journal of Sports Medicine*. 2010; 38(8): 1626-1630.
25. Freedman SR, Brody LT, Rosenthal M, Wise JC. Short-term effects of patellar Kinesio Taping on pain and hop function in patients with patellofemoral pain syndrome. *Sports Physical Therapy*. 2014; 8(4): 294-300.
26. Williams S, Whatman C, Hume PA, Sheerin K. Kinesio Taping in treatment and prevention of sports injuries: A meta-analysis of the evidence for its effectiveness. *Journal of Sports Medicine*. 2012; 42(2): 153-164.
27. Nunes GS, Vargas VZ, Wageck B, Haupenthal DPS, Mederios da Luz C, de Noronha M. Kinesio Taping does not decrease swelling in acute, lateral ankle sprain of athletes: a randomized trial. *Journal of Physiotherapy*. 2015; 61: 28-33.

Appendix A

Bridgewater State University Informed Consent Document

Title of Research:

Kinesio Tex Tape and its Effects on Knee Pain in Division 3 Collegiate Athletes

Researchers:

Investigator

Dr. Pamela J. Russell

Bridgewater State University

Department of Movement Arts, Health Promotion and Leisure Studies

prussell@bridgew.edu, 508-531-2059

Co-Investigator

Victoria Cooley, ATS

Bridgewater State University

Department of Movement Arts, Health Promotion and Leisure Studies

vcooley@student.bridgew.edu, 401-529-7757

You are being asked to participate in a project conducted through Bridgewater State University. The University requires that you give your signed agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask him/her any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have.

If you then decide to participate in the project, please sign on the last page of this form in the presence of the person who explained the project to you. You should be given a copy of this form to keep.

1. Nature and purpose of the Project

The aim of this research is to provide evidence on the use of Kinesio Tex tape in treating pain, and swelling involved with injuries/conditions of the knee joint. The question being researched is “How does Kinesio Tex tape effect pain, and swelling in knee injuries/conditions of Division 3 collegiate athletes?” The answer to this question is being sought out due to the claims that Kinesio Tex tape can help improve each of these factors. It is important to know of such treatment options when working with an athletic population because timely and effective treatments are extremely necessary. Athletes need and want to be back to full participation as soon as possible. Any treatment option that can help clinicians help their patients in an effective and efficient manner should be investigated. For this reason and the lack of current evidence, Kinesio Tex tape is being researched.

2. Explanation of the Procedures

You are being asked to participate in this study as you expressed interest to your certified athletic trainer. If you agree to participate by signing this form, you will then be given a short questionnaire that addresses your personal lower extremity injury history and your knowledge and beliefs about Kinesio tape. After completing the questionnaire, measurements of your knee pain will be taken using the visual analog scale, along with a measurement of your knee girth, using a cm measuring tape. These data will be recorded on a digital device and stored in a secure confidential spot. Next Kinesio Tex tape will be applied to your knee. After tape is applied you will fill out rate your pain again using the visual analog scale and your participation for the day will be complete. One and one-half days later (36 hours), you will meet again with the study co-investigator and to rate your pain using the visual analog scale and to determine your thigh girth. You will then fill out an exit survey and your participation in the study will be complete. The time required for the first session is about 20-25 minutes. The second session lasts about 20 minutes.

Please note throughout the entire study, you will simultaneously follow normal protocol for treatment and rehabilitation as designed by the Certified Athletic Trainers (ATC) at Bridgewater State University.

3. Discomfort and Risks

Risks or discomforts that you might experience include the normal discomforts associated with your knee injury. Your normal treatment protocol of rest, ice, elevation and rehabilitation developed by the Certified Athletic Trainers and Bridgewater State University will be provided to facilitate a healthy healing process for the patient. If you are not compliant with the normal treatment protocol from the BSU athletic trainers, you may feel increased discomfort.

4. Benefits:

As an individual, you may benefit from an increased healing rate provided by the tape application. Sport medicine may benefit as this study seeks to provide group data, as opposed to case study data, for the effects of Kinesio tape. This evidence will help determine if Kinesio Tex tape is a useful treatment option for the athletic community. Although the study is focused only on knee injuries, if the tape helps with pain and swelling in knees, it might also assist the healing process of other joints. The findings may advance athletic treatment in sports medicine.

5. Confidentiality:

Your information will be kept confidential by being stored electronically with the study co-investigator on a device that is securely password protected. You will be assigned a subject number and your name will not be used in any reports. After data collection is complete, the list connecting your name to your number will be shredded and destroyed so that your name will no longer be associated with your number.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;

* Representatives of Bridgewater State University, including the Institutional Review Board, a committee that oversees the research at BSU;

Refusal/Withdrawal:

Refusal to participate in this study will have no effect on any future services you may be entitled to from either University. Anyone who agrees to participate in this study is free to withdraw from the study at any time without penalty.

By signing below I am indicating that I understand that it is not possible to identify all potential risks in an experimental procedure, and I believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks. I agree that all known risk to me have been explained to my satisfaction. I understand that Bridgewater State University and Brown University have no policy or plan to pay for any injuries I might receive as a result of participating in this research protocol.

Participant Signature

Date

Witness Signature

Date

Any questions regarding the conduct of the project, questions pertaining to your rights as a research subject, or research related to injury, should be brought to the attention of the IRB Administrator at (508) 531-1242.

Any questions about the conduct of this research project should be brought to the attention of the principal investigator:

Dr. Pamela J. Russell
Bridgewater State University
Department of Movement Arts, Health Promotion and Leisure
Studies
prussell@bridgew.edu, 508-531-2059

Appendix B

Kinesio Taping® Research Proposal

KTAI Research Committee

1. PROJECT TITLE: Kinesio Tex Tape and its Effects on Inversion Ankle Sprains in Division 1 Collegiate Athletes
 - a. PROPOSAL PREPARED BY: Victoria Cooley, ATS
 - b. INSTITUTION/DEPARTMENT: Bridgewater State University/Department of Movement Arts, Health Promotion and Leisure Studies
 - c. ADDRESS: 36 Love Lane, North Kingstown RI 02852
 - d. PHONE CONTACT NUMBER: 401-529-7757
 - e. CONTACT EMAIL: vcooley@student.bridgew.edu
 - f. DATE OF PROPOSAL: 7/22/2014
 - g. DATE TO BEGIN: 9/2014
 - h. EXPECTED COMPLETION: 5/2015
2. LIST PRIMARY INVESTIGATOR AND CO-INVESTIGATORS/OTHER RESEARCH PERSONNEL: Please list all participating co-investigators and other research personnel and specific years of experience and role in the project.

Primary Investigator: Dr. Pamela Russell

Years of experience: 32

Role: oversee all processes

Co-Investigator: Victoria Cooley, ATS

Years of experience: 4

Role: patient recruitment, consent forms, and all data collection

ATC : initially refers the patients to the co-investigator and supervise the student's clinical skills.

3. PURPOSE OF STUDY: An additional page may be attached fully describing the section below. Please summarize the purpose of the study using non-technical language. The information must include 1, a brief statement of the problem and related theory supporting the intent to study, and 2, a brief but specific description of the procedure(s) involving the subjects in 200 words or less.

This research project intends to add evidence to the use of Kinesio Tex tape in athletes. The question being researched is "How does the application of Kinesio Tex tape affect pain, range of motion and edema in inversion ankle sprains of Division 1 collegiate athletes?" The answer to this question is being sought due to the claims that Kinesio Tex tape can help improve each of these factors. It is important to know of such treatment options when working with an athletic population because timely and effective treatments are extremely necessary. Athletes need and want to be back to their 100% as soon as possible in order to be in full participation. Grade 1 and 2 inversion ankle sprains are the injury being looked at due to their high occurrence rate among athletes. The research is limited to grade 1 and 2 inversion sprains for reason of patient safety. Treatment of Grade 3 inversion ankle sprains may comprise of more advanced and strict protocol. The patient may need to be seen by a physician and we, as study investigators, need to make sure the patient is receiving the utmost proper care. The limitations to our study require that each participant receive the same treatment. Grade 3 inversion sprains may require advanced treatment, and for this reason, are being excluded. Any treatment option that can help clinicians help their patients in an effective and efficient manner should be investigated. For this reason and the lack of current evidence, Kinesio Tex tape application is being researched. The research question will be answered through an investigation that involves the application of Kinesio Tex tape to an inversion ankle sprain of a Division 1 Collegiate athlete. Measurement of pain, range of motion and edema will be taken pre and post tape applications and then the data will be analyzed to compare the effects.

Research participants will be recruited through the ATC that they work with at Brown University. Patients will be referred to the study co-investigator after having been assessed with a grade 1 or 2 inversion ankle sprain by their ATC. The patient will then be given an informative flyer and asked if they would like to participate; if yes, informed consent will be reviewed and signed. They will then be given a questionnaire addressing questions pertaining to their lower extremity injury history and their knowledge and beliefs towards Kinesio tape. Next, measurements of pain using the visual analog scale will be taken. The co-investigator will take and record a measurement of the ankle girth using the figure-8 method. Then measurements using a goniometer will be taken for active range of motion in inversion and eversion. All data will be recorded electronically on a spreadsheet and then stored in a secure spot. After measurements, the lymphatic technique using Kinesio Tex tape will be applied to the patient. It will be left on for 2 days and then the patient will return to have

the same baseline data collected for a second time. At this point the lymphatic technique will be removed and the muscle facilitation technique will be applied to the ankle everters with baseline measurements taken immediately after. The patient will return after 3 days and the same set baseline measurements will be taken. Finally, the patient will return 2 days later to have post-intervention measurements recorded.

4. DESCRIPTION OF SUBJECT POPULATION: Number of subjects to be enrolled, age range, describe populations to be included/excluded from the research.

The inclusion criteria for the selection of 25 subjects include Division 1 collegiate athletes, ages 18-24, with a grade 1 or 2 inversion-only ankle sprain assessed by the referring certified athletic trainer (ATC). The exclusion criteria include any athlete not competing in a varsity sport such as club/recreational sports and athletes who are sensitive to adhesives, allergic to heat (tape is activated by friction/heat), or dislike things on their skin.

5. DESCRIPTION OF STUDY (an additional page should be attached fully describing the section below)

Describe the tasks/tests or procedures subjects will be asked to complete or undergo using non-technical language. Describe the study design and all methods and procedures (sequentially) to which the subjects will be involved in. (Suggestion: explain step by step what the subject will be asked to do and/or procedure performed exclusively for research purposes.) Include duration, intervals of administration and overall length of participation and how evidence will be collected and evaluated.

Type of Study:	Evaluation Measure:	
Control:		
<input type="checkbox"/> Case Study	<input checked="" type="checkbox"/> Subjective	<input type="checkbox"/> Yes
<input type="checkbox"/> Case Control	<input checked="" type="checkbox"/> Visual Analog Skill	<input checked="" type="checkbox"/> No
<input type="checkbox"/> Cohort	<input checked="" type="checkbox"/> Range of Motion	
<input type="checkbox"/> Randomize Control	<input type="checkbox"/> Objective	
<input checked="" type="checkbox"/> Other (Specify)	<input checked="" type="checkbox"/> Other (Specify) circumference	

6. Materials & Support: COSTS (what you are requesting from KTAI) Please give a general description of the estimated amount of product needed and any additional support requested. Approval of these requests is on a case-by-case basis.

There will be 2 taping techniques completed on each subject. The first requiring approximately 8 inches of tape, the second requiring approximately 10 inches.

Multiplying this by 20 subjects leaves us with a requirement of approximately 360 inches.

7. LITERATURE REVIEW: Please include your bibliography or attach the results of a literature search, which justify the involvement of human subjects in this research project.

The aim of this research is to provide evidence on the use of Kinesio Tex tape in treating pain, range of motion and edema. Relevant research has investigated areas of athletics that include these factors but have not directly looked at them specifically in the ankle. Zajt-Kwiatkowska et. al (2007) performed a study on the effects of Kinesio tape on pain in a number of different sports injuries. They specifically looked at five different injuries on five different athletes; one of these injuries being an ankle sprain. In their results, Kinesio tape was identified to decrease the level of pain experienced by the patients. Further supporting these findings, Burke (2005), Nosaka (1999), Thelen, Dauber and Stoneman(2008), and Merino-Marban, Mayorga-Vega, and Fernandez-Rodriguez (2013) all have similar findings in that the application of Kinesio tape eliminated or decreased pain symptoms in athletes. While all findings from this supports one another, most of the evidence is provided through case studies on several different areas of the body. My research is aiming to focus on a group of athletes with the same injury classification in order to provide stronger evidence in this area.

In regards to range of motion (ROM), Hyun Mo et. al.(2012), used The Functional Movement Screen to assess patients. They compared a control group with no tape to a treatment group that had Kinesio tape applied at different lower extremity points bilaterally. Their findings suggested that Kinesio tape had the greatest benefit and showed improvement on joints that are non-weight bearing through the entire joint range of motion in the patient; the results on weight bearing joints (weight bearing joints include one ankles, knees, hips and spine) however, were inconclusive. Further research provided by Murray(2000), investigated the effects of Kinesio taping on muscle strength and ROM in the quadriceps femoris, hamstring and anterior tibialis muscles in individuals with recent anterior cruciate ligament reconstruction. In examining their results, it was shown that there was no difference between the no tape and athletic tape conditions in extensor lag, but there was an improvement in active range of motion in the Kinesio tape condition. Similar findings were seen with the electromyography (EMG) measurements that showed no difference between the no tape and athletic tape condition but an immediate increase in EMG amplitude under the Kinesio tape condition.

When speaking on edema, Bialoszewski (2009) found a significant decrease after Kinesio tape application with their participants. The goal of their research was to examine the Kinesio tape lymphatic technique on patients undergoing

limb lengthening. Along with the patients who received Kinesio tape application, patients who did not receive application experienced a decrease in edema as well. It is noted however, the statistical significance of this decrease was lower than that of the Kinesio tape decrease. Limited research on edema indicates the need to investigate it in this research study.

8. **BENEFITS:** Describe the probable benefits of the research for KTAI. Describe the benefits of the knowledge gained to KTAI, advancement of scientific knowledge and/or benefits to future patients/subjects.

The benefits for the patient are the effects of the Kinesio Tex tape on their injury. Zajt-Kwiatkowska et. al (2007), and Bialoszewski (2009), show decrease in pain and edema. This evidence shows that a benefit to the patients in this study may be an increased rate of healing due to a more optimal healing environment that the tape is providing. The research process allows for them to see progress over a period of time due to the multiple data collection days. This will help with the patients psyche in staying positive about their return to participation.

The anticipated benefits to society and the scientific community are that this research could provide group data evidence for the benefits of Kinesio tape. There is little evidence, beyond case studies, that currently supports or declines the use of Kinesio tape and further evidence will help determine if it can be a useful treatment option within the athletic community. Although the study is focused only on grade 1 and 2 inversion ankle sprains in athletes, if the tape is shown to help with pain, edema and ROM in athletes, it may also be applied to the general public and be used at other joints to help with the healing process. The findings from this study can greatly advance treatments in sports medicine and general medicine as well.

The probable benefits of the research to KTAI are similar to those stated above. This research will be able to add to the evidence based techniques and uses for Kinesio Tex Tape. With this evidence, the Association can better promote their product as a therapeutic and rehabilitative tool.

← ← →



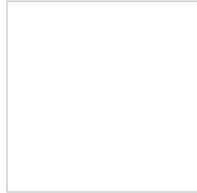
Dorothy Cole <dcole@kinesiotaping.com>

Mon 9/8/2014 7:10 PM
Inbox

Mark as unread

Your proposal was approved although they would like more detail on the particular taping application to be used. Are you still thinking of using Steve Huber's video? Would you like one or two copies of it to be included in your supply order?

Dorothy Cole
KTAI Communications



Kinesio Taping Association International
3901 Georgia Street NE, Building F, Suite 2
Albuquerque, NM 87110
Phone: 505.797.7818 ext. 115
Fax: 505.856.2983
Cell: 505.306.5390
Email: dcole@kinesiotaping.com
www.KinesioTaping.com



Dorothy 1 of 10



Appendix C

Please note that names have been changed for confidentiality reasons

Hello Sam !

My name is Tori Cooley and I'm a second year graduate student here at BSU, studying Athletic Training. To my knowledge your athletic trainer has discussed with you my need for participants for my research; you have expressed interest which is why I am contacting you now.

Simply put, I am looking at patella conditions of the knee and how the application of Kinesio Tex Tape (sometimes called K-tape) affects pain and swelling. I would like to set up a time with you on Friday to meet and give you further details. The meeting is simply for me to inform you of the details so that you can make the decision on whether or not you would like to participate. If after hearing the details about what your participation would entail, and you are still interested, we will review a consent form and further proceed with your participation in the study. The meeting should last a maximum of 15-20 minutes.

Peg has told me that 12 noon seems to be a good time. Please let me know if that time (or another time) works for you. I am free all day Friday so I can easily work with your schedule. Again, it should only be about 15-20 minutes of your time.

You can contact me here or via text/phone call; my information is provided below.

Thank you so much for your interest in participation, I am looking forward to meeting you.

Tori Cooley, ATS
Bridgewater State University
Athletic Training Education Program
vcooley@student.bridgew.edu
401-529-7757

Appendix D

Name: _____

Pt. ID number: _____

1. What sport do you play?

2. How Frequent are your practices and how long do they last? (approximately)

3. Have you had any injuries to your lower extremity (low back, hips, knees, ankle, foot, toes)?
 - a. If so, what was the injury and how was it treated? (be general, ex. Surgery, rehab with AT, rehab with PT.)

4. Have you heard of Kinesio Tex tape? (circle one)
YES NO
 - a. If yes, what are you feelings towards it? Do you believe it works?

5. Are you open to alternative forms of medicine?
YES NO