THE EFFECTS OF FIBULAR REPOSITIONING TAPING ON GENERAL ANKLE FUNCTION IN PHYSICALLY ACTIVE INDIVIDUALS

A THESIS

Submitted to the Faculty of the School of Graduate Studies and Research
of
California University of Pennsylvania in partial fulfillment of the requirements for the degree of

Master of Science

by
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California, Pennsylvania

2011

CALIFORNIA UNIVERSITY of PENNSYLVANIA
CALIFORNIA, PA

THESIS APPROVAL

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ACKNOWLEDGEMENTS

Thank you to my thesis committee: Dr. Kane, Dr. Harman, and Professor Popovich. A special thanks to Dr. Thomas West and Dr. Shelly DiCesaro for further advice and to the rest of the California University of Pennsylvania graduate students. To those undergraduate athletic training students and others who volunteered their time. And lastly, a very special thanks to my parents and Katie.

TABLE OF CONTENTS

INTRODUCTION

Functional ankle instability is a common problem faced by athletic trainers and other medical professionals. Given the athlete's propensity for ankle sprains, treatment of these injuries is a serious issue. Once an athlete is deemed capable of returning to play, taping is a common modality used to reduce the sprain's effects on performance and cause a reduction in pain. However, mechanical effects of lateral ankle sprains may exist beyond the simple stretching of ligaments. An anterior fibular fault can occur when an athlete suffers a lateral ankle sprain. This fault causes the distal fibular head to shift slightly forward, creating a different mechanical state than the entire ankle complex is used to.[1,2] Some speculation exists regarding a relationship between this fault and levels of inflammation following an acute injury; however research regarding these faults is limited.

Before examining the impacts of taping, a thorough understanding of ankle anatomy and strength is required. Ankle sprains typically occur in what is

known as the lateral ankle complex – a series of three ligaments connecting the fibula, talus, and calcaneus. These ligaments are often injured when the foot is forced into inversion and plantarflexion. Due to the structural makeup of ligaments, stretch injuries can leave a degree of laxity in the complex, leading to functional ankle instability. Studies have been conducted examining the impacts of improved strength on ankle function in patients with ankle instability. Unfortunately, results have been mixed; as studies have shown a positive correlation between strength and function but have not determined if there is an improvement in stability.[3-6]

Another key component in ankle function is proprioception – the body's ability to determine where it is in space. Proprioception is governed by certain cells in many different types of body tissues. During an acute injury such as an ankle sprain, these cells are commonly injured either during the injury itself or from the resulting inflammation. Studies have been conducted to determine both the impact of ankle sprains on proprioception and proprioception on ankle function. Results have been mixed, as many factors

such as muscle control and posture may result in insignificant conclusions.[7-9]

Research involving ankle taping in general is plentiful, however significantly defined conclusions are sparse. Prophylactic taping has long been used to reduce the chance of further injury; however research on this topic has been inconclusive. Many studies examining the effectiveness of semi-rigid braces have returned favorable results due to the brace's ability to remain in place for longer periods of time. Most of these taping or bracing studies used balance as an indicator of ankle function, since individuals with functional ankle instability often have notable balance deficits. Taping studies have examined taping procedures supposed negative impact on performance. While studies have concluded that taping exposes the foot and ankle to more force than normal,[10-12] the research does not support a decrease in athletic performance.[1,12]

Given the apparent ambiguity in research related to ankle instability, more research may be necessary. Ankle sprains and the resulting instability is something athletic trainers deal with commonly. The purpose of this study is to examine the effectiveness

of fibular repositioning tape on ankle function in physically active individuals. Improvements in taping techniques could help athletic trainers in their ability to treat sprains and reduce the chance for recurrent injury following return to play. Research into chronic ankle instability and abnormal fibular motion, should provide further insight into a common problem faced by athletic trainers and the athletes themselves.

METHODS

The primary purpose of this study is to determine the efficacy of fibular repositioning taping on the ankles of physically active individuals. The objective of fibular repositioning taping is the prevention of a forward shift of the distal fibular head during the plantar flexion/inversion movement associated with the mechanics of a lateral ankle sprain. Lateral ankle sprains involve the possible sprain of three ligaments – anterior talofibular, posterior talofibular, and calcaneofibular – and are common in athletic competition. While ankle sprains are normally minor injuries, if treated early with rest, the elasticity of the three ligaments may be affected. This can cause the distal fibular head to translate anteriorly, creating a mechanical change in the surrounding structure. Fibular translation taping attempts to pull the distal fibular head back to its initial resting location, therefore reducing strain on the ligaments and increasing ankle function. The following section will address research design, subjects, instruments, procedures, hypotheses, and data analysis.

Research Design

The study was a quasi-experimental design, within subjects, and repeated measures. The independent variable is taping condition – untaped, fibular translation taping, and a standard closed basketweave taping. The dependent variable will be ankle function, as measured through a STAR excursion test.

Subjects

Subjects were recruited from a random sampling of physically active college students from the California University of Pennsylvania. Subjects were recruited via brief in-class presentations. Subjects had to be of college age (18-24 years old) and were defined as "physically active". Physically active was defined as participating in at least 45 minutes of physical activity 3x/week. Each participant had an asymptomatic ankle, having no recent sprain to the ankle.

Each subject completed a comprehensive medical history form, along with an informed consent form (Appendix C1). All subjects were over legal age, thus no further consent

was be necessary. Each participant was present for one 20-30 minute session. The study was approved by the Institutional Review Board of the California University of Pennsylvania (Appendix C2) prior to any subject recruitment or data collection. All participant identities were confidential and not included anywhere in this study.

Preliminary Research

Initial research was conducted to determine efficacy of the testing procedures. The star excursion balance test was used to determine general ankle function. The test is comprised of eight combinations of a partial single leg squat of the dominant leg while reaching in each direction of the uninvolved leg. (Appendix C3)

Initial procedure was designed with two star excursion balance test per testing condition. However, after completing this amount, it was determined that fatigue was too much a factor by the final taping condition. Therefore, the procedure was modified to rely on one trial per subject per taping condition. In addition, this procedure reduced the learning effect produce by repetitive motion.

Instruments

In order to collect the data, a series of tools was used. Taping supplies consisted of: Johnson and Johnson Coach® brand 1 ½ inch white athletic trainer's tape and Medco Pro-Trainer® Foam Underwrap for the basketweave ankle taping, BSN-JOBST brand Leukotape® and Cover-Roll® Stretch Adhesive Bandage for the repositioning tape. The white athletic trainer's tape is a porous, adhesive tape designed to provide firm support without any elasticity present in the tape. Leukotape® is a stronger, more adhesive version of athletic training tape, with even less elasticity and a stronger adhesive. The adhesive bandage is a slightly elastic tape with a light adhesive. This design enabled a base for stronger tapes, such as the Leukotape® and act as an air-permeable bandage. The pre-wrap is a porous underwrapping designed to provide a base of support for tapings while reducing the adverse effects of taping adhesive directly on the skin. Distance was measured by tape measurers and distance markers, and this data was recorded electronically by Microsoft Excel©.

Procedure

Taping was consistent with each participant and included tests with basketweave ankle taping and repositioning tape. The basketweave taping followed consistent guidelines for each participant; two stirrups, two figure-eight patterns, and one heel lock medially and laterally. The fibular repositioning tape required the application of a piece of cover-roll and Leukotape® from slightly anterior to the lateral malleolus wrapping around the posterior aspect of the calf.

Following completion of the paperwork, the proper technique for a star excursion balance test was demonstrated to the participant. The participants were them permitted to practice the testing technique twice. The test involves a single leg squat, with the uninvolved leg reaching for distance in an anterior direction. The squat is defined as a reach of the active leg in a direction without the torso leaning in said direction. The stable leg bends at the knee while the active leg straightens to achieve maximal distance reached. After successful completion of the anterior squat, the participant then repeated the process with the leg angled to anteromedial,

medial, posteromedial, posterior, posterolateral, lateral, and anterolateral directions. Distance was measured through use of marked measures on the floor. The star excursion test utilized precisely measured strips of tape that were arranged in order to provide guidance for the participant. These strips were measured by the examiner following each trial. The participant repeated the procedure once with each taping condition.

Hypotheses

The following hypotheses are based up a complete review of literature and previous research.

1. A significant increase in total score of the star excursion balance test will be shown in trials with fibular repositioning tape.
2. Fibular repositioning tape will improve scores significantly in specific directions.

Data Analysis

The data was analyzed using SPSS statistical software version 18.0 using a repeated measures analysis of variance. The alpha level must be within .05 for significance.

RESULTS

Given the prevalence of ankle sprains in athletics, finding new, efficient ways of treating the symptoms is becoming increasingly necessary. Taping is a constant in the realm of ankle sprain treatment; however typical ankle taping simply provides support by restricting the range of motion of the ankle. This restriction can help prevent the ankle from reaching a position where the injured ankle ligaments are stretched. However, this type of taping does not address the actual injury and is a purely prophylactic measure.[13]

Fibular repositioning taping is a relatively new type of tape which aims to correct a condition known as a fibular fault. During the plantarflexion/inversion movement commonly associated with a lateral ankle ligament injury, the distal head of the fibula may be pulled forward, causing it to be fixed in an anterior position. This creates mechanical disturbances, pain, and a reduction in function. This study attempted to determine the efficacy of fibular repositioning tape as a prophylactic measure, testing its impact on general ankle function in healthy individuals. The following sections

detail demographic information, hypothesis testing, and additional findings.

Demographic Information

Individuals for the study were recruited from three different class presentations within the Department of Health Sciences at California University of Pennsylvania. Of the twenty individuals who agreed to participate, fifteen successfully completed the study. All participants who completed the study had no complications and no injuries occurred during testing.

Participants were screened for several disqualifying conditions. Any individuals with a history of foot and ankle surgery; or had sustained a significant injury to the lower leg in the past six months on the tested leg; were unable to participate. Individuals with a recent history of any condition involving periods of unconsciousness, or seizures, or taking medications which may affect equilibrium or balance were also excluded.

Participants were not screened for gender and were simply restricted to normal college ages (18-24). All individuals were required to be physically active (3x

per week minimum 45 minutes per session). Previous history of ankle injuries was not an excluding factor as long as the above conditions were met. Gender/history distribution was as follows:

Table 1. Demographic Distribution

Individual	Gender	Previous Ankle Injury?
1	F	No
2	M	No
3	F	No
4	F	Yes
5	M	Yes
6	F	Yes
7	F	Yes
8	F	Yes
9	F	No
10	F	No
11	M	Yes
12	F	No
13	M	Yes
14	F	Yes
15	M	Yes

Of the twenty participants recruited, thirteen females and seven males completed the necessary paperwork. Upon time of completion, ten females and five males completed data collection. Nine individuals had a prior history of ankle injury, while six were healthy. Distribution of genders among individuals with previous medical history was roughly equal, with five females and four males having documented medical history.

Hypothesis Testing

The following hypotheses were tested in this study. All hypotheses were tested with a level of significance set at $\alpha \leq 0.05$. A repeated measures ANOVA was calculated for the effect of fibular repositioning tape on general ankle function.

The hypothesis was meant to test overall function of the three taping conditions during a star excursion balance test. The untaped condition a control, providing a comparison for data collected from trials with closed basketweave ankle taping and fibular repositioning tape. Conditions were kept as close to equal as possible to provide the most consistent data.

Hypothesis One:

1. A significant increase in total score of the star excursion balance test will be shown in trials with fibular repositioning tape.

Hypothesis one is designed to test the overall score improvement for fibular repositioning tape in comparison to the untaped control and classic basketweave taping. Data analysis for the first

hypothesis revealed no significant improvement in star excursion balance test overall scores for either taping condition. Significance level was measure at .731. Mean and standard deviation for each taping condition were as follows:

Table 2. Hypothesis One Statistics

Condition	Mean(cm)	Standard Deviation(cm)
Untaped	486.8	67.4
Basketweave	478.4	83.3
Fibular Repositioning	484.8	69.6

Hypothesis Two:

Fibular repositioning tape will improve scores significantly in specific directions.

Hypothesis two examined the effects of fibular repositioning tape at a much more specific degree. Each specific direction of the star excursion balance test was tested under with all taping conditions. Following data analysis, significance level was determined to be .831, revealing no significant difference in the relationship between distance score and direction.

Table 3. Hypothesis Two Statistics

	Untaped	**Basketweave**	**Fibular Repositioning**
Anterior	Mean – 54.5 SD – 7.56	Mean – 51.3 SD – 7.88	Mean - 53.4 SD – 7.03
Anterior non dominant side	Mean – 59.6 SD – 7.33	Mean – 59.6 SD – 9.25	Mean – 60.7 SD – 7.45
Non dominant side	Mean – 62.3 SD – 7.41	Mean – 63.6 SD – 12.2	Mean – 63.9 SD – 10.9
Posterior non dominant side	Mean – 70.8 SD – 10.0	Mean – 72.1 SD – 14.3	Mean – 73.1 SD -14.3
Posterior	Mean – 71.1 SD – 12.8	Mean – 68.6 SD – 13.4	Mean – 70.8 SD – 14.3
Posterior dominant side	Mean – 68.8 SD – 13.8	Mean – 67.0 SD – 13.2	Mean – 67.1 SD – 10.3
Dominant side	Mean – 46.1 SD – 10.7	Mean – 43.1 SD – 12.5	Mean – 43.4 SD – 9.7
Anterior dominant side	Mean – 53.7 SD – 12.4	Mean – 53.1 SD – 14.1	Mean – 52.3 SD – 9.2

SD – Standard Deviation

(Any explanation needed for directional information may be found in appendix C3)

Additional Findings

After data analysis discovered no significance in either hypothesis, it was determined that in healthy individuals, fibular repositioning tape has minimal benefit to the subject. However, given the possible benefit to the athlete in a case of lateral ankle sprain or chronic ankle instability, more research into the taping is may be warranted. Research

conducted during rehabilitation from lateral ankle sprains may be the next logical step, as these athletes are prone to developing a fibular fault. Examining subjects with chronic ankle instability is also a necessary step, as the taping could possibly help prevent recurring ankle sprains in these individuals. Additional research on fibular repositioning taping may produce a recommendation based on scientific data as a method to prevent recurring ankle sprains.

With regard to this particular study, several factors could be looked at to further determine if fibular repositioning tape is recommended in healthy individuals. Although there is no conclusive evidence from this study, comparing exact results between genders could lead to further In addition, the relatively small sample size of this study may have skewed the data. Results may have been altered by the fact that leg length, individual height, and flexibility were not considered. These factors contributed to the effects on distance scores, so balancing the study composition could significantly affect the end data.

DISCUSSION

Given the relative weakness of the lateral ligament complex of the ankle, sprains to any of these three ligaments are a very common sports injury. Injury to the complex results in moderate to severe pain and varying levels of impaired function. However, the chronic implications of ankle sprains may be far worse, since the healing process of these ligaments often fails to complete. Laxity in these ligaments, and associated instability, may leave an individual predisposed to further ankle sprains upon return to competition.

This instability may lead to a misplacement of the distal fibular head commonly referred to as an anterior fibular fault. This fault is produced through the mechanism of plantar flexion/inversion, which may reduce the ability of the ankle complex to function properly. One common measure taken to reduce the effects of the ankle sprain is ankle taping, where a stiff tape is applied in a specific pattern to reduce range of motion and provide support. However, in the case of an athlete with this anterior fibular fault, the taping may not actually address what is causing a

significant amount of the pain and reduction in function.

While basketweave ankle taping has proven to be a viable form of prophylactic and post-injury treatment for many ankle injuries,[9-13] individuals with an anterior fibular fault may need a more targeted taping solution. Fibular repositioning tape is an emerging taping which attempts to correct the fibular fault. This technique may provide extra stability to the ankle and reducing chance for further injury. The following discussion is broken down into three sections: discussion of results, conclusions, and further recommendations.

Discussion of Results

After data analysis was complete, it was determined that there was no significant link between taping condition and performance on the star excursion balance test. Many factors could determine significance in this test. Firstly, the sample size was very small, containing fifteen individuals. Secondly, there were twice as many female participants as male participants. Thirdly, although gender has not

been shown to have any effect on ligament laxity, further examination may help determine if there is any difference between genders.

Several factors regarding participant selection were not addressed due to the limited pool of individuals from which to draw. Individuals were allowed to participate with prior ankle injury, as long as no surgical procedure was conducted and the injury was not within six months from time of data collection. Also, no attempt was made to control any physical factors (height, flexibility, etc) which could affect test results.

Due to controls of the study, the individuals who participated in the study did not necessarily have any condition related to chronic ankle instability. This somewhat invalidates the reasoning for use of fibular repositioning tape based on past studies. However the closed basketweave taping also did not provide any increase in score over the untaped control. Therefore, it is possible that either taping has no effect on performance of a star excursion balance test.

Conclusions

Data analysis confirmed that neither hypothesis tested provided any level of significance. Hypothesis one tested the performance of fibular repositioning tape with regard to total score on the star excursion balance test. Overall the mean performance for each of the three taping conditions was very similar, with untaped actually having the best performance. However, given the relatively complex motions involved with a star excursion balance test, a measurement of total score may not provide the best indicator of ankle function. Performance on the Star excursion balance test has a large degree of variability, as certain motions may prove difficult than others.

Hypothesis two provided a specific look at the data by focusing on results restricted to each individual motion. Results were again not significant, as each direction remained relatively constant throughout each of the three taping conditions. No direction established significance, and all data provided remained fairly constant for any condition.

Further Recommendations

Given the recent arrival of fibular repositioning tape to the sports medicine scene, data regarding its efficacy is still scarce. Research must continue to determine the proper conditions for use of fibular repositioning tape. Various groups of individuals must be taped, with a special focus on individuals who have suffered varied ankle afflictions that fibular repositioning tape is proposed to relieve. This research may provide adequate comparison to research on healthy individuals and will solidify the case for use of fibular repositioning tape.

Future participants must also be recruited from a broader variety of backgrounds. Research on different ages and activities may help determine the efficacy of fibular repositioning tape. Also, activities aside from the star excursion balance test may also provide data more consistent with the effects of the taping during traditional fast moving athletic activities. It is rare that an athlete will find themselves in a situation where static balance is necessary, thus further necessitating this need for research.

Currently, very little research regarding fibular repositioning tape’s effect on function of the ankle

exists. Further research using techniques such as electromyography to determine muscle activity will help drastically in proving the efficacy of the taping, as the ankle complex works not only through the static stability of its ligaments, but also the dynamic stability provided by surrounding musculature.

In conclusion the future of treating ankle sprains and ankle instability could be drastically changed by use of fibular repositioning taping. A modality which may provide more comfort for the athlete, uses less tape, more time efficient, and attempts to correct the exact fault could prove an invaluable technique for sports medicine specialists everywhere. Chronic ankle instability is a condition which may be caused by one ankle sprain and may affect the athlete's ability to perform for the test of their athletic life. The ability to treat this condition in a conservative way through prophylactic treatment and strengthening programs could revolutionize treatment for this condition. Further research is certainly necessary in all aspects of fibular repositioning tape if the treatment is to become more widespread and trusted. With many of these concerns addressed, treatment of lateral ankle pathology is certain to advance even further.

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APPENDICES

APPENDIX A

Review of Literature

REVIEW OF LITERATURE

Ankle taping in its various forms is a common technique for athletic trainers looking to improve stability of the ankle, while decreasing pain and improving the athlete's ability to perform. Typically, ankle taping is used in order to support an injury to the lateral ligament complex, though taping can be modified to support both the medial complex and the surrounding ankle musculature. However, a recent technique known as fibular translation taping may be able to improve the effectiveness of taping significantly.[29] With any lateral ligament complex injury, a certain amount of displacement of the distal fibular head is present, leading to malfunction of the surrounding structures. Fibular repositioning taping helps to stabilize and correctly position the distal fibular head, leading to decreased strain on the injured ligament complex and improving functionality. This is commonly seen in both acutely injured patients and patients with a chronically unstable ankle. Hence, the purpose of this literature review is to examine the effects of taping in general, its effects on

balance and function, the anatomical background for ankle sprains, chronic ankle insufficiency, and any other therapeutic possibilities.

Ankle Strength and Anatomic Structure

The ankle joint, or talocrural joint, is the connection between the foot and the rest of the lower limb, analogous to the wrist of the upper extremity. The joint is made up of three main bones: the talus, fibula, and tibia. The joint articulates to provide dorsiflexion and plantarflexion, acting as a hinge joint. The joint is supported by a combination of ligaments and muscles. The medial ligament complex, commonly known as the deltoid ligament, is very strong. Sprains of the tibiofibular ligaments, connecting the distal ends of both lower leg bones, are much less commonly injured. Muscular support for the ankle comes mostly from the peroneal and tibialis muscles, along with the static ligaments.

One significant topic related to functional ankle instability is the actual mechanical reasons behind any present instability. A review by Hubbard examines the mechanical reasons behind chronic lateral ankle

instability and the relationship between the talocrural and subtalar joins. The review focused on the increased hypermobility associated with chronic ankle instability along with any associated hypomobility. The review found a lack of evidence to determine the relationship between functional and mechanical effects of ankle instability. However, the review did focus on several different ways to evaluate a chronically unstable ankle and the possible steps to take to return function to normal.[1]

While the anatomical basis behind ankle instability is significant, the function of the entire ankle system must also be explored. A study by Buchanan examined the impacts that functional ankle instability has on an athlete's ability to perform on a macroscopic level.[2] Using two functional performance tests, a single-leg hopping test and a single-leg hurdle test, athletes with and without functional ankle instability were assessed for performance. While the athletes with the pathology reported a feeling of instability, performance in the tests was not significantly different from the control group.

A study by Mucha examined a typical proprioceptive training routing versus an isokinetic strength

training routing and measured strength, movement, and function. Thirty nine participants were separated into two groups: one with a proprioceptive training routine and the other using a strength training routine centered around use of a Cybex machine. Strength in the Cybex group was found to be significantly improved at the end of three weeks, and range of motion was decreased. It may be determined that through use of a functional strength training regimen, a more stable ankle could be produced.[3]

The general strength of the ankle complex provides a significant impact on the presence and debilitation in athletes with functional ankle instability. Many different studies examining the impacts of leg strengthening on instability have been conducted, however results have been uncertain. It remains to be seen whether or not the greatest influence on stability is had by evertor or invertor musculature, or neither. A review by Holmes examines these studies, concluding that while evertor strengthening may reduce the chance of ankle sprains, athletes with ankle instability are more likely to have invertor strength deficits.[4] An analysis lead by Arnold did find a correlation between concentric evertor strength and

functional ankle instability, however issues with data collection rendered the data potentially unreliable[5].

Given the prevalence of ankle sprains in athletics, a common field of research is the impact that many treatments have on those individuals with chronic sprains. Taping is a very common form of both prevention and treatment of ankle sprains and instability, often used on all arenas of sport. A study by Sanioglu was designed to test the influence of ankle taping on isokinetic strength in taekwondo athletes. Twenty-one percent of all taekwondo injuries occur in the ankles, many requiring manual taping intervention. A combination of jumping exercises was performed on both legs, in taped and untapped conditions. The tests were performed and resulted with a measure of torque not significantly reduced in the taped ankle, while jump high was substantially reduced in the taped ankle.[6]

Studies conducted on the correlation between strength and have shown that any improvement in ankle strength can improve overall function. Some studies have experimented with chronically unstable ankles, and have produced mixed results. While improving strength in a chronically unstable ankle certainly can

improve function, whether or not it improves the stability is yet to be conclusively seen.

Proprioception and Balance

Proprioception is the ability of the body's periphery to generate information regarding spatial awareness. Injury to the area reduces the effectiveness of proprioceptive nerve cells, affecting balance and muscle reaction. These cells are typically found in muscles, tendons, and articular surfaces. These cells produce information from tactile feeling and reflexes, providing the brain another basis for determining spatial awareness aside from typical sensory information (sight, feeling, hearing). Studies involving proprioception often rely on the presence of a certain pathology, or the introduction of a treatment such as taping or bracing.

Given the common incidence of ankle sprains in sports, a large amount of literature is available. With rehabilitation for these injuries common, the impact of proprioception on ankle function is a common research field as well. A review by Eils looked at the role of active proprioception in patients with

standard lateral ankle sprains. Only studies where the primary basis for proprioception was simple exercise were included, totaling eight studies. This excluded all studies which used external devices, including taping, bracing, and not rigid supports. The study concluded that while there is an existing belief that proprioceptive exercise reduces chance of ankle sprain, the literature does not bring forth sufficient evidence.[7]

A study conducted by Leanderson examined the influence of proprioceptive deficits in a sport commonly associated with athletes of exceptional balance – ballet dance. Given the nature of ballet dance, the possibility of ankle injury is significant. Fifty three ballet dancers and twenty six healthy controls participated, and six of the dancers suffered grade two or three ankle sprains following initial recordings. These participants were observed and measured for sway and proprioception. The study concluded that as the healing process advances, postural sway improves and proprioception returns. [8]

While the previous studies examined basic proprioception, an important research topic is the influence of taping and bracing on proprioception. A

study by Lohkamp examined the possibility of ankle taping effecting fatigue, which often predisposes athletes to ankle injury. Ten healthy semi-professional male soccer players were placed on a treadmill for a forty-five minute routine designed to simulate the constant motion and speed changes of a soccer match. Postural stability was assessed every seven and a half minutes. The study concluded that due to fatigue and reaction, proprioceptive benefit may be minimal. [9]

A review by Hughes also examined available literature on the effect of taping on proprioception participants with functional ankle instability. Due to many factors, including kinesthesia, muscle control, and postural sway, many studies were not comprehensive enough to provide quality information. While nine studies were found matching the specifications, the review concluded that further study is needed before a quality answer can be found.[10]

Proprioceptive deficits are common, as they can be effected by many different things. In a study by Hesar, the influences of the menstrual cycle on proprioception is examined. Twenty five healthy female participants with no current hormone therapy were

selected. Each participant had blood taken to determine which phase of the menstrual cycle the participants were currently on, and data was grouped accordingly. All participants had their joint position measured using a Biodex unit. The data suggested no correlation between menstrual cycle and ankle proprioception, regardless of the current phase of the menstrual cycle.[11]

Studies focused on the topic of proprioception have shown mixed results. The topic is significantly broad, creating a situation where finding consistent information is challenging. Many factors influence the Studies have been able to conclude that there may be little correlation between ankle strength and injury.

Ankle Instability

Chronic ankle instability is commonly seen among athletes who have had multiple ankle sprains. Typically, the lateral ligaments, commonly injured during an inversion ankle sprain, are stretched beyond their means, creating an inherent instability in the talofibular articulation. This may predispose the ankle to recurrent lateral ankle sprains, along with

other pathologies of the lower extremity. The effect of chronic ankle instability on ankle proprioception is commonly researched, given the effects lack of proprioception can have on the entire kinetic chain.

A significant amount of literature questions the impact of ankle instability on balance and proprioception. A study by de Noronha examines the effects of functional ankle instability on balance via two common functional tests. Twenty controls and twenty individuals aged 18-40 with a history of ankle instability were tested. Proprioception and motor control were tested via the Landing Test and Hopping Test. The study found that there was little correlation between the proprioceptive ability and ankle instability[12]. The study also found little correlation between proprioception and motor control. However, this does not rule out the impact that proprioception and/or motor control have within one month of injury, as all subjects were at least one month post injury.

Research by Hardy focused on the effects of two different types of prophylactic ankle braces on balance and reach distance. Thirty six participants were tested under three conditions; no brace, a semi-

rigid brace, and a standard lace-up ankle brace. Data was collected using a star test after six trials per participant, per condition. The study found no significant effects of prophylactic ankle bracing on reach distance given the difference between the control and full brace was less than two inches[13].

In a study by Lee, twelve patients were put on a twelve week program designed to strengthen the ankle and improve proprioception. The participants all had self-reported functional ankle instability, and participated in a two to one male to female ratio. After the twelve week training program, all patients had improved stability in the ankle and improve proprioception, thus neuromuscular function improved along with muscular strength.[14]

Research conducted by Powers examined thirty eight participants with self-reported functional ankle instability were tested for muscle fatigue via EMG, while static balance was tested via force plate. After a six week strength training program, the study found no concrete evidence of improvement via strength or proprioception training. No correlation or combination of the two was found to be effective.[15]

Much of the ankles ability to remain stable results from its ability to give proprioceptive feedback to the brain. Ankle taping, along with anything else rigid impacts the skin and the propioceptors contained within. A study by Refshauge tested the impacts of ankle taping on proprioceptive feeling within the ankle. Participants were recruited with a history of at least on ankle sprain and tested in both taped an untapped environments. The subjects then had their ankles moved in the inversion-eversion plane and then tested for proprioceptive feeling. The study resulted in a lack of proprioceptive feeling.[16]

Acute sprains are also a possible area of research as they relate to balance and proprioception. In a study by Fu, twenty basketball players with bilateral ankle sprains were tested to determine the levels of postural control. The study found a positive relationship between proprioception and postural control and a significant increase in both.[17]

A common treatment for ankle instability involves the use of manual manipulation to improve strength and decrease any present mechanical deficiencies. Proprioception is a key component of balance, and some literature claims that the application of taping

reduces balance due to the restriction of proprioceptors in the skin. The Kohne study looks at the possibility that manual manipulation of an ankle joint can improve proprioception in patients with ankle instability. Out of thirty participants, the fifteen placed in the experimental groups were found to have significant gains in pain and function of the joint, as dorsiflexion range of motion was increased. The study theorized that manual manipulation may be a prudent treatment in order to decrease future occurrences of ankle sprains.[18]

Studies on the subject of chronic ankle instability and its effect on general function of the ankle have so far been inconsistent. Studies have been able to conclude that while improving the strength of the ankle has been shown to improve function, this may just be a natural part of the rehab process and may not correlate with any improvement in stability.

Taping and External Supports

Given its popularity as a therapeutic tool with athletic trainers, ankle taping has spawned a significant amount of research. Prophylactic taping is

normally used following an acute injury and after rehabilitation if any instability is caused by the injury. Ankle taping is also used for the purpose of preventing injury, especially in athletes with a history of acute sprains. This instability can have detrimental effects of balance and performance, creating a significant roadblock in the athlete's eventual return to competition. Existing research on the topic also includes studies based on custom supports and rigid bracing in place of prophylactic taping. Many of the studies for both methods of support are based around balance, as it seems to be a significant indicator of general ankle function.

The positive effects of ankle taping are well researched and widespread in clinical practice. A review by Kadakia examines one of the more common uses for ankle taping – prevention of injury in an otherwise asymptomatic athlete. This review examined the effect of bracing and taping on range of motion and the prevention of ankle sprains in athletes. Eight articles were used based on three criteria; the article must pose a research question on prevention of ankle sprains, ankle range of motion must be tested, and the article must contain data on the incidence of

ankle sprains. The review concluded that while both ankle taping and semi-rigid bracing are sufficient modalities to reduce the occurrence of ankle sprains, however more direct comparison must be done to determine the efficacy of one over another.[19]

Another study relative to the positive effects of bracing was conducted by Wikstrom. This study focused on the relationship between prophylactic ankle bracing versus control in terms to stability in unstable ankles. Twenty Eight subjects with unilateral functional ankle instability participated, measured with a two legged jump landing on the unstable leg. The study found no improvement in dynamic stability with the application of a brace, however an improvement in vertical score was noted.[20]

One controversial theory about taping and bracing is their negative impact on performance[1]. A study by Abian-Vicen examines the effects of ankle taping on jump and balance tests in fifteen individuals with no history of ankle injury. The subjects performed jumps in both static and dynamic position and were measured both prior to take off and at the time of landing. The study found no significant differences in force production upon takeoff, however there was a twelve

percent increase in force produced upon landing. This may indicated an increase risk of chronic injury while taped, as the foot and ankle are exposed to greater levels of force than normal.[21]

Ankle taping is so common in athletics that its effects beyond support are commonly overlooked. A study by Hume examined both the positive and negative impacts of ankle taping on the unstable ankle. This review examined the use of several different types of external bracing devices for use in lateral ankle sprains in rugby players. The review acts upon two questions – is there support for use of these devices in rugby, and is the decrease in performance with use of these devices great enough to reduce efficacy of these devices? The review concluded that there is proper support for use of these devices, and that the reduced performance is not sufficient to discontinue their use.[22]

While ankle taping/bracing may remain one of the most commonly used modalities to treat and prevent ankle sprains, some controversy exists as to whether or not they negatively impact the athlete's performance. A study by Rosenbaum took a comprehensive look at thirty-four athletes with self reported

chronic ankle instabilities with ten braces; one rigid, five semi rigid, and four soft models. The participants were run through a complex course with each brace three times and tested both subjectively and objectively. The participants responded with negative feeling for many of the braces, however no objective difference was found except for the vertical jump with the rigid brace. [23]

With taping and bracing being as common as they area, their impact on the mechanical workings of the ankle must be investigated. Research by Cordova examined the angular motion of an ankle during inversion with a semi-rigid and lace up brace. Twenty four healthy individuals were examined with each brace type five times while walking on a thirty-five degree platform. The study concluded that the semi-rigid brace was far superior in preventing rearfoot motion and angular rotation compared to the lace-up brace.[24]

A study by Zinder examined the effects of external bracing devices on joint stiffness in chronically unstable ankles. Twenty eight participants were chosen, all healthy – fourteen had a unilaterally unstable ankle. The participants were fitted with EMG electrodes and a cradle system to measure muscle

activity and joint stiffness. The study concluded that the braces passively increased joint stiffness and stability in chronically unstable ankles.[25]

Research by Hartsell further examined the mechanical workings of the ankle; however this research focused on the actual forces exerted on the ankle. This study was designed to examine isokinetic torque on participants wearing semi-rigid and flexible braces. Fourteen chronically unstable ankles and ten healthy controls were tested for four categories; joint motion, muscle contraction, brace condition, and velocity. The study found that the chronically unstable ankles were far weaker; however their ability to produce torque was unchanged. Thus, bracing can be used for prevention without reducing the torque production capacity of the ankle.[26]

Another look into common forces placed on the ankle and the effect of taping was conducted by Tohyama. This study examined the reaction of the ankle joint under a condition of bracing, inversion, and axial compression. The study examined rotation and subtalar motion under certain conditions. Three bracers were tested; two being semi-rigid store bought braces and the third being a lace up brace. Subtalar

motion was significantly reduced with axial compression, and the results of testing with the semi-rigid braces resulted in the belief that these bracers are better at reducing excess motion required to cause an ankle sprain.[27]

Further research by Cordova examined the influence of an external ankle support on lower extremity joint mechanics and vertical ground reaction forces. Thirteen recreational basketball athletes with no ankle pathology within the last year were tested on a one legged drop from three feet under three conditions: untaped, closed basketweave taping, and a semi-rigid brace. The study concluded that ankle and knee displacement were less in the groups with external ankle support devices. Both also appeared to be better equipped to reduce the effects of group reaction forces.[28]

Given their reliability and the variance in taping styles, ankle bracing is a more popular choice for research versus prophylactic taping. Of the studies used, focus is evenly split between balance, sprain prevention, and more focused goals such as axial compression and rearfoot motion. Studies looking at the impacts of taping or bracing on patients with a

chronically unstable ankle were common. The prevalence of bracing studies was not surprising, given the common practice of taping and bracing present in athletic training practice. Some of the more specific studies looked at the effects of bracing or taping on strength and force production, acting upon the hypothesis that there are negative effects of prophylactic bracing. Overall, much of the research supports the use of bracing or taping, lending credence to the practice.

Fibular Repositioning Tape

Fibular repositioning tape is a recent development in the realm of ankle taping. With many lateral ankle sprains, the distal head of the fibula is misaligned, creating increased pain and loss of function. Similar to a McConnell taping of the knee, the taping is applied with a posterior force to the fibula. This force attempts to correct any anterior fibular fault caused by the ligamentous insufficiency. The fault can not only be found in cases of acute sprain, however cases of chronic instability can also trigger the fault.

Research into fibular translation taping is rare, as the taping is a recent development and has not become widespread in clinical use. A study by East focused on the effects of fibular repositioning tape on landing. Participants in the study were ages 18-30 with a history of unilateral chronic ankle instability. CAI was defined as having at least one previous inversion ankle sprain which required a prolonged period of anti-weight bearing immobilization.[29] Results determined that fibular repositioning tape had an effect on ankle kinematics, and may reduce the instability present upon landing.

A key part of understanding the function of fibular translation taping is understanding the mechanical reasons behind fibular faults. A study by Candal-Couto, examined fibular movement in seven cadaver specimens where the ligaments had been cut[4]. Previous literature had theorized that most of the motion of the fibular occurred in the coronal plane, however this study intended on examining the importance of sagittal motion of the fibula. After the sequential removal of several ligaments and the interosseous membrane, the study determined that most

of the motion of the fibula does actually occur in the sagittal plane.[30]

In a study by Lofvenberg, twenty nine patients were tested in both dorsiflexion and plantarflexion of the ankle during abduction and anterior drawer tests. Fibular shifts were present mostly in the dorsiflexed position, indicating the possibility that this shift in a dorsiflexed position is an occurrence in a chronically unstable ankle. Rotation of the fibula was either insignificant or nonexistent.[31]

Studies on the topic of fibular repositioning tape have been limited to this point. The technique is still very new, and needs to be researched further before significant conclusions can be drawn. So far, the correction of a fibular fault has shown promising results, whether it be from direct intervention such as taping, or through programs designed to improve general strength of the area.

Summary

Given the extremely common occurrence of ankle sprains, any possible preventative treatment must be thoroughly researched and supported. Classic

basketweave taping has been held up through research, and when done properly provides significant improvements in ankle stability while boosting the morale and psychological wellbeing of the athlete. However, much of the pain and mechanical issues still remain with this type of taping, and fibular repositioning may provide some improvement to this situation. By correcting the fibular fault present with both acute sprains and unstable ankles, repositioning taping can be used in many different situations and combined with other forms of preventative therapy. Unfortunately, research into the taping method is scarce, thus the technique has not become widespread and must be researched more thoroughly to prove its efficacy.

APPENDIX B

The Problem

THE PROBLEM

Statement of the Problem

The purpose of this study was to determine the effectiveness of fibular repositioning taping on physically active individuals. Given the prevalence of lateral ankle sprains in athletic competition, ankle taping is an important part of an athletic trainer's repertoire and must be used effectively. Fibular repositioning taping is an experimental variant of ankle taping, designed to correct a common fibular fault associate with sprains of the talofibular ligaments leading to functional ankle instability.

It is important to examine the efficacy of this taping procedure, as it could lead to a great advancement in the treatment of ankle sprains and an improvement in performance for injured athletes. Significant research has been conducted on classic ankle taping; however, very little research on fibular translation taping exists, creating an uncertain situation where the efficacy of the taping is relegated to personal clinical experience. Conversely, it must be found if the taping truly has an advantage

over classic ankle tapings, cementing its place in athletic training practice.

Definition of Terms

The following definitions of terms will be defined for this study:

1) Fibular Repositioning Taping – A taping designed to correct a mechanical fault of the distal fibular head caused by repeated injury to the talofibular ligaments.
2) Ankle Taping – A series of coordinated applications of tape designed to improve ankle stability.
3) Ankle Sprain – A stretch injury to the lateral ligament complex of the ankle – particularly the anterior and posterior talofibular ligaments and the calcaneofibular ligament.

Basic Assumptions

The following are basic assumptions of this study:

1) The subjects will be honest when they complete their demographic sheets and medical history sheets.

2) Taping will be applied in near identical fashion each time.
3) Physically active ankles will be asymptomatic for any pathology

Limitations of the Study

The following are possible limitations of the study:

1) Participants may have little experience being taped.
2) Participants may not have instability or a fibular fault, so the main function of the tape may not be present.

Significance of the Study

Ankle taping has a vast amount of research examining its effectiveness; however its impacts on athletes with chronic ankle instability are largely unknown. Currently, very little research exists on fibular repositioning taping. Much speculation on anterior fibular faults has determined their presence in chronically unstable ankles, thus the need for taping procedures designed to reduce this fault is significant. Given the propensity for ankle sprains in

sports, this research could help vastly improve treatment of both acute ankle sprains and ankle instability. With this research, the use of fibular repositioning taping can expand beyond its current experimental status.

APPENDIX C

APPENDIX C1

Introductory Letter

Introductory Letter

To Whom It May Concern,

I, Joseph Fiorina ATC, would like to request your participation in a research study. The study involves research into an experimental type of ankle taping designed to provide support for the ankle in a very different way from standard ankle taping. You will be asked to perform one exercise, a Star Excursion Balance Test, under three different taping conditions: untaped, classic basketweave ankle taping, and the experimental fibular repositioning tape. The Star Excursion Balance Test is a simple test designed to examine ankle function and balance while minimizing excess stress on the body.

As an optional study, you will have the opportunity to remove yourself from consideration at any point. If you feel what is being asked of you is not safe, you have the right to any action which could make you feel more comfortable. The study has been approved by the California University of Pennsylvania Institutional Review. Any questions, comments, or concerns regarding the safety or efficacy of the trial may be referred to the examiner or the Institutional Review Board.

Enclosed is a quick medical history questionnaire to be filled out if you have interest in participating in the study. Any information requested therein which you feel is unnecessary may be left blank; however eligibility to participate in the study will be determined at the discretion of the examiner.

Thank you for consideration of participation in the study. Any further questions you have can be answered by contacting me at FIO9474@calu.edu or at 650-814-9208.

Joseph Fiorina, ATC

California University of Pennsylvania

Informed Consent Form

1. Joseph Fiorina, who is a Graduate Athletic Training Student at California University of Pennsylvania, has requested my participation in a research study at California University of Pennsylvania. The title of the research is The Effects of Fibular Repositioning Tape on General Ankle Function in Athletes.

2. I have been informed that the purpose of this study is to examine the effectiveness of a new, less complex form of ankle taping. I understand that I must be 18 years of age or older to participate. I understand that I have been asked to participate along with 19 other individuals who qualify as physically active. To qualify, I must participate in at least forty-five minutes of physical activity three times per week or more. I also must not have any musculoskeletal or other disorders which could affect my performance in the study.

3. I have been invited to participate in this research project. My participation is voluntary and I can choose to discontinue my participation at any time without penalty or loss of benefits. My participation will involve the performance of a STAR excursion balance test to determine the efficacy of the fibular repositioning tape. I understand that the STAR test is a single leg squat in multiple directions while leaning with my non-weight bearing leg. I will move in a counter-clockwise direction, performing the squat and reach until I return to the original point of the star directly ahead of me. The test will be performed over a star shaped pattern of measured tape, and I will be asked to reach for every point in the star. The examiner will take measurements with each motion and I will be given rest periods of one minute between each trial. These rest periods will include an updated status on how I am feeling and also may include the application of the next taping. I will be taped for two of the three trials, while the third trial will have no taping present.

4. I understand there are foreseeable risks or discomforts to me if I agree to participate in the study. With participation in a research program such as this there is always the potential for unforeseeable risks as well. The taping conditions could result in mild skin irritation. The researcher will also ask about any possible allergies to reduce the change of allergic reaction to the tape, adhesive, or pre-wrap. As with any balance exercise, there is always the possibility of falling. I will never be alone, and the researcher will always be within reach to help prevent a fall.

5. I understand that, in case of injury, I can expect to receive treatment or care in Hamer Hall's Athletic Training Facility. This treatment will be provided by the researcher, Joseph Fiorina, a certified athletic trainer under the supervision of the CalU athletic training faculty, all of which are certified by the state to administer emergency care. Additional services needed for prolonged care will be referred to the attending staff at the Downey Garofola Health Services located on campus.

6. There are no feasible alternative procedures available for this study.

7. I understand that the possible benefits of my participation in the research are the determination of the effects of fibular repositioning tape on ankle stability. This can help determine the general efficacy of the taping and well as possibly leading to the need for further advanced research.

8. I understand that the results of the research study may be published but my name or identity will not be revealed. Only aggregate data will be reported. In order to maintain confidentially of my records, Joseph Fiorina will maintain all documents in a secure location on campus and password protect all electronic files so that only the student researcher and research advisor can access the data. Each subject will be given a specific subject number to represent his or her name so as to protect the anonymity of each subject.

9. I have been informed that I will not be compensated for my participation.

10. I have been informed that any questions I have concerning the research study or my participation in it, before or after my consent, will be answered by:

Joseph Fiorina, ATC
STUDENT/PRIMARY RESEARCHER
FIO9474@calu.edu
650-814-9208

Dr. Robert Kane, Ed.D, ATC
RESEARCH ADVISOR
Kane@calu.edu
1-724-938-4562

11. I have read the above information and am electing to participate in this study. The nature, demands, risks, and benefits of the project have been explained to me. I knowingly assume the risks involved, and understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself. In signing this consent form, I am not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to me upon request.

12. This study has been approved by the California University of Pennsylvania Institutional Review Board.

13. The IRB approval dates for this project are from: 02/23/2011 to 02/22/2012

Subject's signature:_____
Date:_____

Witness signature:_____
Date:_____

Appendix C2:

Medical History Form

Medical History Questionnaire

Name _____
Last First
Date of Birth _____ Gender _____
E-Mail Address _____
Phone (_____) _____

General Medical History

1. Please circle any applicable medical condition for which you currently have or have been treated in the past.

Seizures	Marfan Syndrome	Attention Deficit Disorder
Diabetes	Connective Tissue Disease	Attention Deficit Hyperactivity Disorder
Cancer	Heart Disease	Osteogensis Imperfecta
Vertigo	Inner Ear Disorders	

2. Are you currently on any medications that may affect your balance or ability to exercise?

Yes No

If so, please list the medications:_____

3. Have you ever experienced recurrent fainting and/or unexplained loss of consciousness?

Yes No

4. Do you have any allergies to latex or adhesive tape?

Yes No

5. Have you suffered a lower body injury within the last six months?

Yes No

If so, please explain:_____

6. Have you ever had surgery for a foot or ankle condition?

Yes No

If so, please explain:_____

7. Have you ever sprained an ankle?

Yes No

If so, how long ago was the injury and what kind of treatment did you receive?_____
_____
_____

8. Have you ever seen a physician/physical therapist/athletic trainer or other healthcare professional for any ankle injury?

Yes No

If so, please explain the nature of treatment: _____

_____

_____

APPENDIX C3

Institutional Review Board –

California University of Pennsylvania

Proposal Number

Date Received

California University of Pennsylvania

PROTOCOL for Research Involving Human Subjects

Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects

(Reference IRB Policies and Procedures for clarification)

Project Title ***The Effects of Fibular Repositioning Tape on General Ankle Function in Physically Active Individuals***

Researcher/Project Director ***Joseph Fiorina***

Phone # ***650-814-9208*** ***E-mail Address*** ***FIO9474@calu.edu***

Faculty Sponsor (if required) ***Dr. Robert Kane***

Department ***Health Science***

Project Dates ***September 2010*** ***to*** ***September 2011***

Sponsoring Agent (if applicable) _____

Project to be Conducted at *California University of Pennsylvania*

Project Purpose: ☒ ***Thesis*** ☐ ***Research*** ☐ ***Class Project*** ☐ ***Other***

Keep a copy of this form for your records.

Please attach a typed, detailed summary of your project AND complete items 2 through 6.

1. *Provide an overview of your project-proposal describing what you plan to do and how you will go about doing it. Include any hypothesis(ses)or research questions that might be involved and explain how the information you gather will be analyzed. For a complete list of what should be included in your summary, please refer to Appendix B of the IRB Policies and Procedures Manual.*

   This study is designed to determine the efficacy of fibular repositioning taping on physically active individuals. This taping is designed to reduce the effects of an anterior fibular fault - an anterior displacement of the distal fibular head commonly seen in cases of ankle instability and acute ankle sprain. The study will involve college age (18-24) individuals engaged in rigorous physical activity. These individuals will follow a detailed examination of their medical history and will be fully made aware of their influence while participating in the study. After the initial meetings with the participants, each participant will return in order to participate in the data collection phase of the study. The independent variable tested will be the taping condition - untaped, fibular repositioning tape, and a standard closed basketweave ankle tape.

   Taping will be consistent with each participant, and will include tests with only basketweave ankle taping and repositioning tape. The basketweave taping will follow consistent guidelines for each participant; three stirrups, two figure-eight patterns, and one heel lock medially and laterally. The fibular repositioning tape will require the application of a piece of leukotape placed over a slightly longer piece of cover-roll from slightly anterior to the lateral malleolus wrapping around the posterior aspect of the calf.

   Following completion of the paperwork, the participant will be shown the proper technique for a STAR excursion test and be given the change to briefly practice. The test involved a single leg squat, with the uninvolved leg reaching for distance in an anterior direction. The squat is defined as a reach of the active leg in a direction without the torso leaning in said direction. The stable leg will bend at the knee while the active leg will straighten to achieve maximal distant reached. After successful completion of the anterior squat, the participant will then repeat the process with the leg angled to anteromedial, medial, posteromedial, posterior, posterolateral, lateral, and anterolateral directions. Distance will be measured through use of marked measures on the floor. For the STAR excursion test, precisely measured strips of tape will be laid out in order to provide guidance for the participant. These strips will be labeled for distance and measured by the examiner during the test. The participant will repeat the procedure twice with each taping condition. In order to keep data consistent, a constant rest period will be.

   The study is designed to test three major hypotheses. The first hypothesis tested will determine the efficacy of the fibular translation taping on physically active individuals. The second will determine if there is any difference in support and function between the fibular repositioning taping and closed basketweave taping. If the hypotheses are correct, the fibular repositioning taping will prove superior in both situations. The numerical data will be collected and stored on a spreadsheet produce by Microsoft Excel©. Once collected and organized, the data will be analyzed via SPSS Statistical Software version 17.0 during a repeated measures analysis of variance test.

2. *Section 46.11 of the Federal Regulations state that research proposals involving human subjects must satisfy certain requirements before the IRB can grant approval. You should describe in detail how the following requirements will be satisfied. Be sure to address each area separately.*

    a. *How will you insure that any risks to subjects are minimized? If there are potential risks, describe what will be done to minimize these risks. If there are risks, describe why the risks to participants are reasonable in relation to the anticipated benefits.*

    No participant in the study will be alone at any point during the process of testing. The participant will be accompanied closely by the examiner during the STAR test and precautions will be in place in case of loss of balance. A STAR excursion test does not require perfect balance, thus the risk for untrained/partially trained individuals in minimal. The participant will not be placed in any position beyond the instructions for the test. No participant will have a recent injury to the ankle, lower leg, hip, or back regions so aggravation of a current injury will not be possible.

    The taping conditions could result in mild skin irritation. The closed basketweave ankle taping will require the use of pre-wrap - a thin, porous film designed to provide a barrier between the tape and skin. This will negate any negative skin irritation caused by the adhesive itself or the removal of the taping. The fibular repositioning tape will not allow the use of any barrier between the adhesive and the skin, thus the risk of skin irritation is present. No further adhesive beyond the mild adhesive present on the cover-roll base tape will be used and no device will be necessary to remove the taping. All products used are hypoallergenic and will not cause adverse reactions in patients with latex or other allergies.

    b. *How will you insure that the selection of subjects is equitable? Take into account your purpose(s). Be sure you address research problems involving vulnerable populations such as children, prisoners, pregnant women, mentally disabled persons, and economically or educationally disadvantaged persons. If this is an in-class project describe how you will minimize the possibility that students will feel coerced.*

    The study participants will be drawn among physically active students from California University of Pennsylvania.The participants will be recruited through brief in-class presentations in Dr. Chris Harman's HSC 115 - Current Health Courses. Participation will be optional, course credit will not be offered or earned for participation, and the professor will not be physically present at any time to minimize the perception of coercion. These individuals will by definition participate in some sort of rigorous physical activity at least three times per week for at least forty-five minutes per session. All participants will be of college age (18-24) and will not have sustained an acute ankle injury within the last six months. To keep results consistent, the individuals must not have sustained a sprain severe enough to require any sort of surgical intervention or have been associated with a fibular or tibial fracture at any time in the past. A detailed medical questionnaire will be completed by the participant.

    c. *How will you obtain informed consent from each participant or the subject's legally authorized representative and ensure that all consent forms are appropriately documented? Be sure to attach a copy of your consent form to the project summary.*

After initial contact with the participant, the participant will be required to meet with the examiner to complete paperwork and receive information pertinent to their participation. This meeting will be held in private, with no other individuals present. All personal data will be kept confidential and an identification number will be used for each participant. During this meeting the participant will complete the appropriate forms related to medical history, informed consent, and receive information relevant to the STAR test and the process of data collection. All forms will be completed fully as a prerequisite for participation in the study.

d. Show that the research plan makes provisions to monitor the data collected to insure the safety of all subjects. This includes the privacy of subjects' responses and provisions for maintaining the security and confidentiality of the data.

All data collected will be stored in confidence and shared with no other individuals. Any numerical data will be collected via computer and kept in a password protected file on a password protected account on the examiner's personal computer. Any paper forms will be kept in the office of the department chair of the graduate athletic training department, Dr. Thomas West. Each individual participant will be assigned an identification number upon initial filing of paperwork, and the name will appear on no paper form. Identification numbers and names will be matched up and stored in the same fashion as the numerical data.

3. Check the appropriate box(es) that describe the subjects you plan to use.

☒ *Adult volunteers*	☐ *Mentally Disabled People*
☒ *CAL University Students*	☐ *Economically Disadvantaged People*
☐ *Other Students*	☐ *Educationally Disadvantaged People*
☐ *Prisoners*	☐ *Fetuses or fetal material*
☐ *Pregnant Women*	☐ *Children Under 18*
☐ *Physically Handicapped People*	☐ *Neonates*

4. Is remuneration involved in your project? ☐ *Yes or* ☒ *No. If yes, Explain here.*

5. Is this project part of a grant? ☐ *Yes or* ☒ *No If yes, provide the following information:*

Title of the Grant Proposal _____

Name of the Funding Agency _____

Dates of the Project Period _____

6. Does your project involve the debriefing of those who participated? ☐ *Yes or* ☒ *No*

If Yes, explain the debriefing process here.

7. If your project involves a questionnaire interview, ensure that it meets the requirements of Appendix___in the Policies and Procedures Manual.

California University of Pennsylvania Institutional Review Board
Survey/Interview/Questionnaire Consent Checklist (v021209)

This form MUST accompany all IRB review requests

Does your research involve ONLY a survey, interview or questionnaire?

☐ **YES**—Complete this form

☒ **NO**—You MUST complete the "Informed Consent Checklist"—skip the remainder of this form

Does your survey/interview/questionnaire cover letter or explanatory statement include:

☐ (1) Statement about the general nature of the survey and how the data will be used?

☐ (2) Statement as to who the primary researcher is, including name, phone, and email address?

☐ (3) FOR ALL STUDENTS: Is the faculty advisor's name and contact information provided?

☐ (4) Statement that participation is voluntary?

☐ (5) Statement that participation may be discontinued at any time without penalty and all data discarded?

☐ (6) Statement that the results are confidential?

☐ (7) Statement that results are anonymous?

☐ (8) Statement as to level of risk anticipated or that minimal risk is anticipated? (NOTE: If more than minimal risk is anticipated, a full consent form is required—and the Informed Consent Checklist must be completed)

☐ (9) Statement that returning the survey is an indication of consent to use the data?

☐ (10) Who to contact regarding the project and how to contact this person?

☐ (11) Statement as to where the results will be housed and how maintained? (unless otherwise approved by the IRB, must be a secure location on University premises)

☐ (12) Is there text equivalent to: "Approved by the California University of Pennsylvania Institutional Review Board. This approval is effective nn/nn/nn and expires mm/mm/mm"? (the actual dates will be specified in the approval notice from the IRB)?

☐ (13) FOR ELECTRONIC/WEBSITE SURVEYS: Does the text of the cover letter or
explanatory statement appear before any data is requested from the participant?

☐ (14) FOR ELECTONIC/WEBSITE SURVEYS: Can the participant discontinue participation at any point in the process and all data is immediately discarded?

California University of Pennsylvania Institutional Review Board
Informed Consent Checklist (v021209)

This form MUST accompany all IRB review requests

Does your research involve ONLY a survey, interview, or questionnaire?
☐ **YES**—DO NOT complete this form. You MUST complete the "Survey/Interview/Questionnaire Consent Checklist" instead.
☒ **NO**—Complete the remainder of this form.

1. Introduction (check each)
☒ (1.1) Is there a statement that the study involves research?
☒ (1.2) Is there an explanation of the purpose of the research?

2. Is the participant. (check each)
☒ (2.1) Given an invitation to participate?
☒ (2.2) Told why he/she was selected.
☒ (2.3) Told the expected duration of the participation.
☒ (2.4) Informed that participation is voluntary?
☒ (2.5) Informed that all records are confidential?
☒ (2.6) Told that he/she may withdraw from the research at any time without penalty or loss of benefits?
☒ (2.7) 18 years of age or older? (if not, see Section #9, Special Considerations below)

3. Procedures (check each).
☒ (3.1) Are the procedures identified and explained?
☒ (3.2) Are the procedures that are being investigated clearly identified?
☒ (3.3) Are treatment conditions identified?

4. Risks and discomforts. (check each)
☒ (4.1) Are foreseeable risks or discomforts identified?
☒ (4.2) Is the likelihood of any risks or discomforts identified?
☒ (4.3) Is there a description of the steps that will be taken to minimize any risks or discomforts?
☒ (4.4) Is there an acknowledgement of potentially unforeseeable risks?
☒ (4.5) Is the participant informed about what treatment or follow up courses of action are available should there be some physical, emotional, or psychological harm?
☒ (4.6) Is there a description of the benefits, if any, to the participant or to others that may be reasonably expected from the research and an estimate of the likelihood of these benefits?
☒ (4.7) Is there a disclosure of any appropriate alternative procedures or courses of treatment that might be advantageous to the participant?

5. Records and documentation. (check each)

☒ (5.1) Is there a statement describing how records will be kept confidential?
☒ (5.2) Is there a statement as to where the records will be kept and that this is a secure location?
☒ (5.3) Is there a statement as to who will have access to the records?

6. For research involving more than minimal risk (check each),

☐ (6.1) Is there an explanation and description of any compensation and other medical or counseling treatments that are available if the participants are injured through participation?

☐ (6.2) Is there a statement where further information can be obtained regarding the treatments?

☐ (6.3) Is there information regarding who to contact in the event of research-related injury?

7. Contacts.(check each)

☒ (7.1) Is the participant given a list of contacts for answers to questions about the research and the participant's rights?

☒ (7.2) Is the principal researcher identified with name and phone number and email address?

☒ (7.3) FOR ALL STUDENTS: Is the faculty advisor's name and contact information provided?

8. General Considerations (check each)

☒ (8.1) Is there a statement indicating that the participant is making a decision whether or not to participate, and that his/her signature indicates that he/she has decided to participate having read and discussed the information in the informed consent?

☒ (8.2) Are all technical terms fully explained to the participant?

☒ (8.3) Is the informed consent written at a level that the participant can understand?

☒ (8.4) Is there text equivalent to: "Approved by the California University of Pennsylvania Institutional Review Board. This approval is effective nn/nn/nn and expires mm/mm/mm"? (the actual dates will be specified in the approval notice from the IRB)

9. Specific Considerations (check as appropriate)

☐ (9.1) If the participant is or may become pregnant is there a statement that the particular treatment or procedure may involve risks, foreseeable or currently unforeseeable, to the participant or to the embryo or fetus?

☐ (9.2) Is there a statement specifying the circumstances in which the participation may be terminated by the investigator without the participant's consent?

☐ (9.3) Are any costs to the participant clearly spelled out?

☒ (9.4) If the participant desires to withdraw from the research, are procedures for orderly termination spelled out?

☒ (9.5) Is there a statement that the Principal Investigator will inform the participant or any significant new findings developed during the research that may affect them and influence their willingness to continue participation?

☐ (9.6) Is the participant is less than 18 years of age? If so, a parent or guardian must sign the consent form and assent must be obtained from the child

☐Is the consent form written in such a manner that it is clear that the parent/guardian is giving permission for their child to participate?

☐Is a child assent form being used?

☐ Does the assent form (if used) clearly indicate that the child can freely refuse to participate or discontinue participation at any time without penalty or coercion?

☒ (9.7) Are all consent and assent forms written at a level that the intended participant can understand? (generally, 8th grade level for adults, age-appropriate for children)

California University of Pennsylvania Institutional Review Board
Review Request Checklist (v021209)

This form MUST accompany all IRB review requests.
Unless otherwise specified, ALL items must be present in your review request.

Have you:
☒ (1.0) FOR ALL STUDIES: Completed ALL items on the Review Request Form?
Pay particular attention to:
☒ (1.1) Names and email addresses of all investigators
☒ (1.1.1) FOR ALL STUDENTS: use only your CalU email address)
☒ (1.1.2) FOR ALL STUDENTS: Name and email address of your faculty research advisor
☒ (1.2) Project dates (must be in the future—no studies will be approved which have already begun or scheduled to begin before final IRB approval—NO EXCEPTIONS)
☒ (1.3) Answered completely and in detail, the questions in items 2a through 2d?
☒2a: NOTE: No studies can have zero risk, the lowest risk is "minimal risk". If more than minimal risk is involved you MUST:
☒ i. Delineate all anticipated risks in detail;
☒ ii. Explain in detail how these risks will be minimized;
☒ iii. Detail the procedures for dealing with adverse outcomes due to these risks.
☒ iv. Cite peer reviewed references in support of your explanation.
☒ 2b. Complete all items.
☒ 2c. Describe informed consent procedures in detail.
☒ 2d. NOTE: to maintain security and confidentiality of data, all study records must be housed in a secure (locked) location ON UNIVERSITY PREMISES. The actual location (department, office, etc.) must be specified in your explanation and be listed on any consent forms or cover letters.
☐ (1.4) Checked all appropriate boxes in Section 3? If participants under the age of 18 years are to be included (regardless of what the study involves) you MUST:
☐ (1.4.1) Obtain informed consent from the parent or guardian—consent forms must be written so that it is clear that the parent/guardian is giving permission for their child to participate.
☐ (1.4.2) Document how you will obtain assent from the child—This must be done in an age-appropriate manner. Regardless of whether the parent/guardian has given permission, a child is completely free to refuse to participate, so the investigator must document how the child indicated agreement to participate ("assent").
☐ (1.5) Included all grant information in section 5?

☐ (1.6) Included ALL signatures?

☒ (2.0) FOR STUDIES INVOLVING MORE THAN JUST SURVEYS, INTERVIEWS, OR QUESTIONNAIRES:

☒ (2.1) Attached a copy of all consent form(s)?

☐ (2.2) FOR STUDIES INVOLVING INDIVIDUALS LESS THAN 18 YEARS OF AGE: attached a copy of all assent forms (if such a form is used)?

☐ (2.3) Completed and attached a copy of the Consent Form Checklist? (as appropriate—see that checklist for instructions)

☐ (3.0) FOR STUDIES INVOLVING ONLY SURVEYS, INTERVIEWS, OR QUESTIONNAIRES:

☐ (3.1) Attached a copy of the cover letter/information sheet?

☐ (3.2) Completed and attached a copy of the Survey/Interview/Questionnaire Consent Checklist? (see that checklist for instructions)

☐ (3.3) Attached a copy of the actual survey, interview, or questionnaire questions in their final form?

☒ (4.0) FOR ALL STUDENTS: Has your faculty research advisor:

☐ (4.1) Thoroughly reviewed and approved your study?

☐ (4.2) Thoroughly reviewed and approved your IRB paperwork? including:

- ☐ (4.2.1) Review request form,
- ☐ (4.2.2) All consent forms, (if used)
- ☐ (4.2.3) All assent forms (if used)
- ☐ (4.2.4) All Survey/Interview/Questionnaire cover letters (if used)
- ☐ (4.2.5) All checklists

☐ (4.3) IMPORTANT NOTE: Your advisor's signature on the review request form indicates that they have thoroughly reviewed your proposal and verified that it meets all IRB and University requirements.

☐ (5.0) Have you retained a copy of all submitted documentation for your records?

Project Director's Certification

Program Involving HUMAN SUBJECTS

The proposed investigation involves the use of human subjects and I am submitting the complete application form and project description to the Institutional Review Board for Research Involving Human Subjects.

I understand that Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects. If the Board grants approval of this application, I agree to:

1. Abide by any conditions or changes in the project required by the Board.
2. Report to the Board any change in the research plan that affects the method of using human subjects before such change is instituted.
3. Report to the Board any problems that arise in connection with the use of human subjects.
4. Seek advice of the Board whenever I believe such advice is necessary or would be helpful.
5. Secure the informed, written consent of all human subjects participating in the project.
6. Cooperate with the Board in its effort to provide a continuing review after investigations have been initiated.

I have reviewed the Federal and State regulations concerning the use of human subjects in research and training programs and the guidelines. I agree to abide by the regulations and guidelines aforementioned and will adhere to policies and procedures described in my application. I understand that changes to the research must be approved by the IRB before they are implemented.

Professional Research

Project Director's Signature	Department Chairperson's Signature

Student or Class Research

Student Researcher's Signature	
Supervising Faculty Member's Signature if required	Department Chairperson's Signature

ACTION OF REVIEW BOARD (IRB use only)

The Institutional Review Board for Research Involving Human Subjects has reviewed this application to ascertain whether or not the proposed project:

1. provides adequate safeguards of the rights and welfare of human subjects involved in the investigations;
2. uses appropriate methods to obtain informed, written consent;
3. indicates that the potential benefits of the investigation substantially outweigh the risk involved.
4. provides adequate debriefing of human participants.
5. provides adequate follow-up services to participants who may have incurred physical, mental, or emotional harm.

☐ Approved[_____] ☐ Disapproved

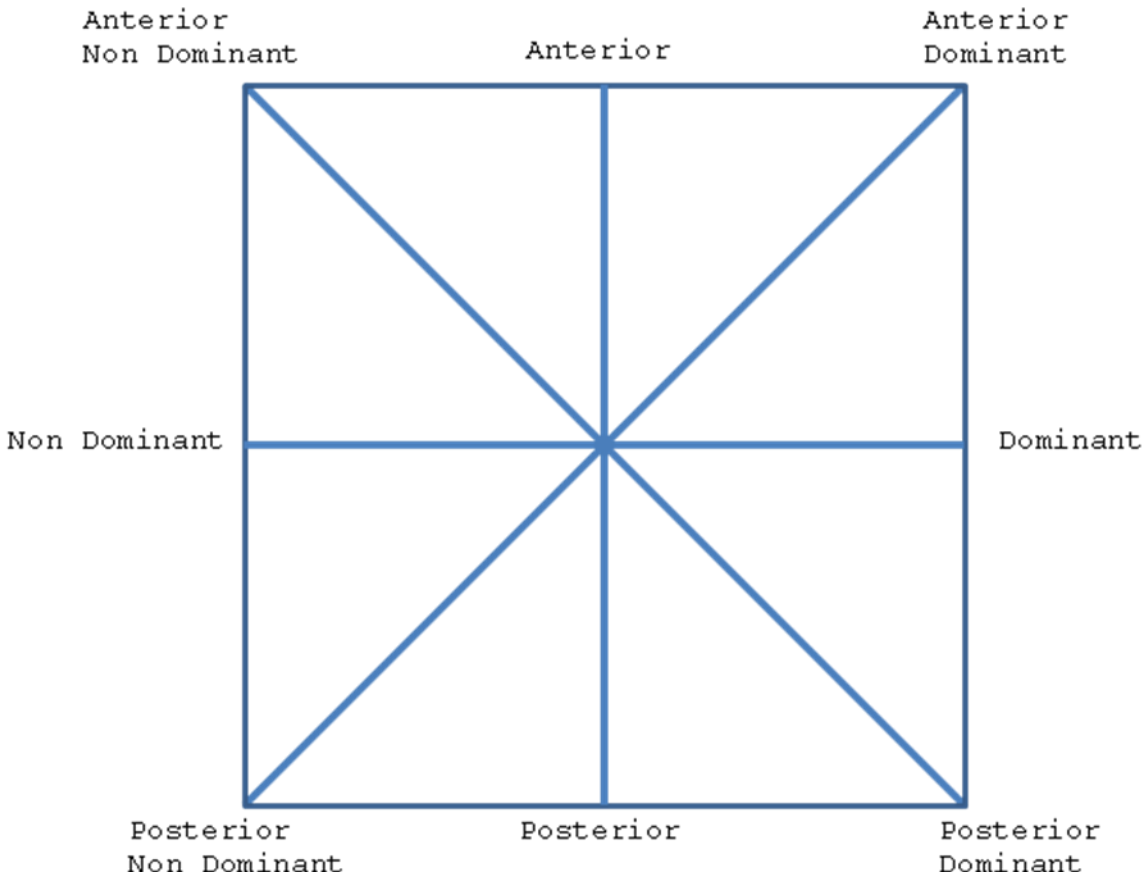
_____ _____

Chairperson, Institutional Review Board Date

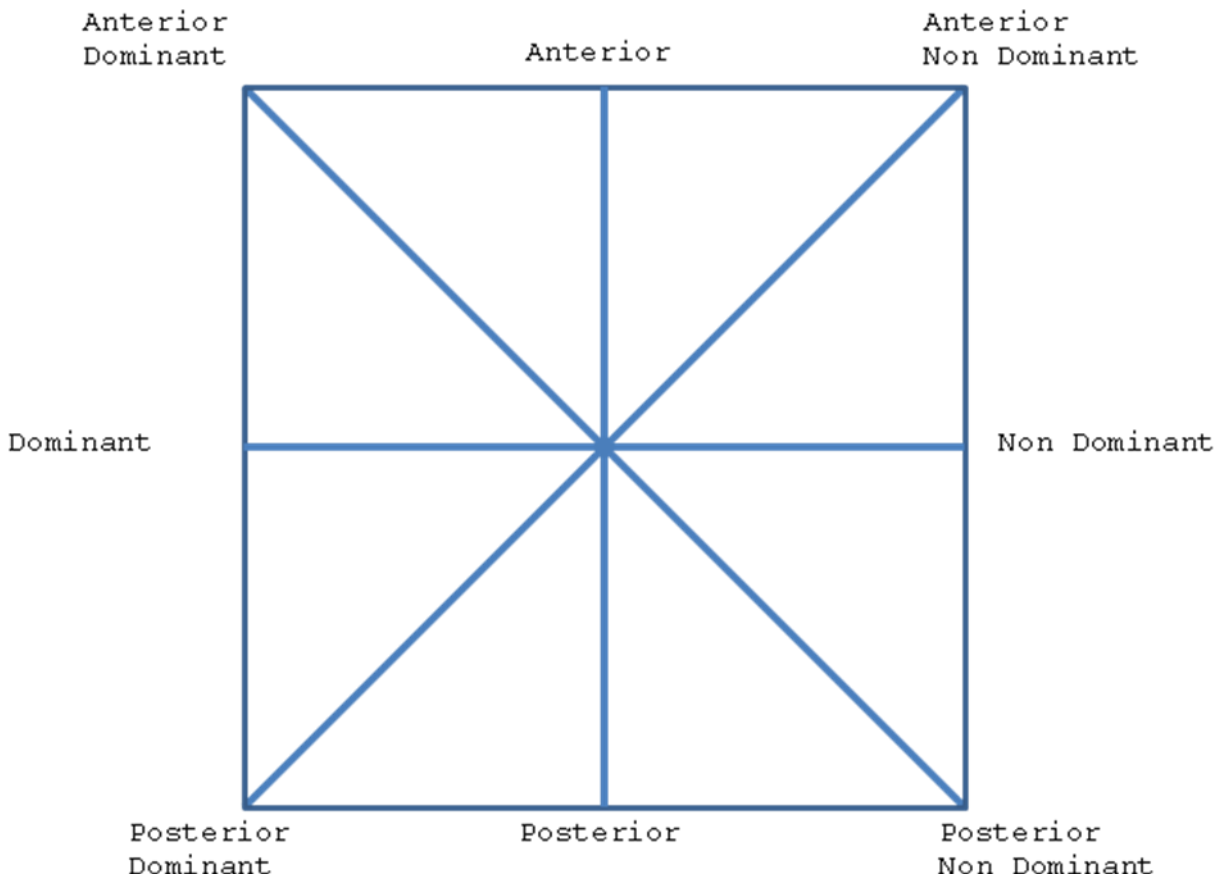
Appendix C4:

Star Testing Models Based on Dominant Foot

Right Foot Dominant



Left Foot Dominant



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ABSTRACT

Title: The Effects of Fibular Repositioning Tape on General Ankle Function in Athletes

Researcher: Joseph R. Fiorina, ATC, PES

Advisor: Robert Kane, EdD, PT, ATC

Date: April 2011

Research Type: Master's Thesis

Problem: Lateral ankle sprains and chronic ankle instability are common afflictions among athlete. Unfortunately, many athletes suffer long term consequences despite immediate treatment. One possibility behind these lingering maladies is an anterior fibular fault, where the distal fibular head is pulled forward by the plantarflexion/inversion mechanism and fails to return to its original location.

Purpose: This study is designed to test the efficacy of fibular repositioning tape. The taping, similar to the McConnell taping for abnormal patellar tracking, attempts to correct a present fibular fault by providing a posterior force on the distal fibular head.

Methods: Participants were collected from college age (18-24) individuals currently attending California University of Pennsylvania. Disqualifying factors for participation included a recent (within the previous six months) lateral ankle injury, prior surgical procedures on the foot or ankle, and any conditions which could result in their injury during data collection. The effects of the taping were measured via total distance scores collected from a star excursion balance test. Data was collected and analyzed to test the effects of both fibular repositioning tape and closed

basketweave taping on both total distance score and specific directions.

Findings: This data was analyzed via SPSS statistical software with a repeated measures analysis of variance. Following analysis, it was determined that there was no significant difference between the untaped control and either taping condition. Given these results and the current lack of informative data regarding fibular repositioning tape, further research is certainly needed.