The Effects of Kinesio Tape on Sports Performance: Vertical Jump and Shuttle Run Performance in Women's College Basketball Players

Holly Wohltman

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The Effects of Kinesio Tape on Sports Performance: Vertical Jump and Shuttle Run Performance in Women's College Basketball Players

(TITLE)

BY
Holly Wohltman

THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Masters of Science IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY CHARLESTON, ILLINOIS

2015 YEAR

I HEREBY RECOMMEND THAT THIS THESIS BE ACCEPTED AS FULFILLING THIS PART OF THE GRADUATE DEGREE CITED ABOVE

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The Effects of KT tape on Sports Performance: Vertical Jump and Shuttle Run Performance in Women’s Collegiate Basketball Players

Abstract

Introduction: Since Kinesio tape (KT tape) was invented in the mid-1970s, studies have been lacking in producing strong evidence to support the claims of its ability to enhance performance. The purpose of this study was to determine the effects of KT tape at enhancing sports performance, in the areas of vertical jump and shuttle run performance, in Illinois College Women’s Basketball Team, participants ranged from 19-22 years of age.

Methods: There were eleven female basketball players ranging from the ages 19-22 years were recruited to participate in this study. All participants performed a vertical jump test and a shuttle run test while in each of the three treatment variables, KT tape, Placebo tape, and no tape.

Results: Mean and standard deviation were calculated from each of the treatment variables in both of the exercise tests and then a one-way ANOVA was performed using IBM SPSS Statistics for Windows Version 20.0. A significant difference was not found amongst the treatment variables in the vertical jump or shuttle run test.

Conclusions: Based on the results obtained from this study it was determined that in the tested participants, KT tape was not an effective treatment at enhancing sports performance in the areas of vertical jump height and shuttle run agility.
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CHAPTER I

INTRODUCTION

Background

Kinesiology tape (KT tape) was developed in the mid-1970s by a Japanese chiropractor by the name of Kenzo Kase (Locke, 2012). KT tape is made out of 100% high-grade cotton, which is latex free and elastic, to mimic the human skin. The material of the tape itself provides a uni-directional elasticity, which only allows the tape to increase in length and not width. KT tape’s design provides support and stability to the applied area without restricting range of motion, while also helping facilitate the body’s natural healing process (Bastholt, 2014). The weave design of the material allows for mini pores to form which allow for the release of moisture, whether it be sweat or water (Bastholt, 2014). This allows for the tape to stay in the applied position and on the applied area for up to a 5-day increment, lasting through showers, workouts, and normal day movements. It fastens to the skin by a heat-activated adhesive that is light, mild, and hypoallergenic (Kase, 2013).

The effectiveness of KT tape is all in the application process. KT tape is applied to either an injured muscle or the target muscle that you wish to enhance in sports performance and range of motion (Kase, 2003). For muscles that have been injured or over-used it is best to apply the tape with no tension and from the insertion to origin of the muscle (Kase, 2003). When you wish to improve or support full range of motion of the desired muscle you apply the tape with light tension and from origin to insertion (Kase, 2003). There are different techniques to applying the KT tape and they vary by
which muscles are being involved in the activity or that are injured. The utilization of stretch while applying is very important as well. The KT tape stretch varies by increments of 25, 50, 75, and 100%, and applying the correct stretch varies from what area is being taped and what result you want to optimize (Kase, 2013). Once KT tape is applied to the desired area, convolutions are made on the skin that result in the skin being lifted away from the soft tissue, allowing for more blood flow to the damaged and/or desired muscle (Drouin, 2013). The more blood that is allowed to flow to a desired area will promote a quicker healing process to the damaged muscle. It is also claimed that the tape works by targeting different receptors in the somatosensory system by facilitating lymphatic drainage by microscopically lifting the skin through the convolutions discussed earlier (Kase, 2003). These convolutions in the skin increase interstitial space, which allows for a decrease in the inflammation of the affected area (Kase, 2013). Claims say that proper utilization of the KT tape can have many beneficial attributes; which include “re-educating the neuromuscular system, reduce pain and inflammation, enhance performance, prevent injury and promote good circulation and healing, and assist in returning the body to homeostasis” (Kase, 2013).

With all these claims of how beneficial KT tape can be, there is no real definitive evidence that supports its ability to enhance sports performance. Skeptics believe that a difference in performance between when an athlete is taped and not taped is mainly associated to a psychological placebo effect (Locke, 2012). It is said to be comparable to any other type of pregame ritual that many athletes perform and is more of a comfort thing to him/her. A literature synthesis was done to find evidence-based studies that supported the positive effects of KT tape on athletic performance. This study went into
great detail searching and assessing literature on the effects of KT tape and only found
ten articles that met the inclusion criteria. Only seven of the ten articles had positive
results where KT taped athletes performed better than the control (Drouin, 2013). Ten
studies on the effects of KT tape on sports performance is not nearly enough to support or
oppose positive or negative claims made on this taping form.

Statement of Purpose

The purpose of this study was to determine the effects of KT tape at enhancing
sports performance, specifically in the areas of vertical jump and shuttle run performance,
Illinois College Women’s Basketball team (18-22 years old). Speed and vertical jump
performance are very important areas when it comes to basketball which is why these two
performance areas were picked to be studied.

Delimitations

This study consisted of a few delimitations that should be addressed. Due to a
time constraint, only one women’s basketball team was able to be tested and they only
consisted of eleven women. This will cause the results found not to be applicable to other
populations that are different from those that have been tested. Also, due to the time
constraint the duration of the taping was only on the girls for a few minutes while they
performed the exercises. According to Slupik (2007), muscle motor units increase
maximally after 24 hours of application of KT tape. The last delimitation of this study
was that the researcher did not incorporate the hip or knee flexors into the taping process.
Limitations

One limitation of this study was that the researcher had no control on the environment while the participants were being tested. The participants were taped in the athletic training room at Illinois College and then performed exercises in the main gym, so there could be athletes coming in and out during the application or testing processes. Having people observing the participants could cause them to perform differently than if they were being tested in a controlled environment with no distractions.

Another limitation to the study was that the participants could have prior knowledge of the claims of sports enhancing benefits of KT tape. Even though I would not be revealing that I was using KT tape, the participants could have prior knowledge of what KT tape feels and looks like. Since I had no control of what the participant did prior to being tested, this could also be seen as a limitation. The last limitation expected from this study was that the timing system could be faulty, which would cause the results to be skewed.

Hypothesis

It was hypothesized that:

1. The application of KT tape to the triceps surae of both the right and left leg of each participant would result in no effect on vertical jump performance.
2. The application of KT tape to the triceps surae of both the right and left leg of each participant would result in no effect on shuttle run performance.
During the push-off phase of running and jumping the triceps surae, which includes the gastrocnemius and soleus muscles, are activated (Bastholt, 2014). The application of the KT tape to this area was viewed as a desirable placement because of the activation of the triceps surae.

Operational Definitions

Brower Automatic Timing System: This automatic speed trap timer recorded the athlete’s shuttle run times to the hundredth of a second, starts upon the athlete’s foot releases from the pressure sensitive foot pad, and stops when the athlete passes through the infrared finish line beam (Brower, 2015).

KT Tape: Elastic, ultra-light and strong, tape used to provide pain relief, stability and support without restricting range of motion, and quicker recovery in injured or sore muscles or joints (Bastholt, 2014).

Shuttle Run Test: This test is used to evaluate an athlete’s ability to accelerate between marked lines and to rapidly change direction (Mackenzie, 2007).

Triceps Surae: This muscular unit refers to the combination of the medial and lateral gastrocnemius and soleus muscles. The fascia coverings of these muscles combine inferiorly to form the Achilles tendon, which is the tendon that connects these muscles to the calcaneus. This group of muscles serves as the principle decelerators of the leg (triceps surae, 2009).
Vertec: A common apparatus used for testing vertical jump height. It has a steel frame base and pole with horizontal vanes toward the top of the pole that are measured in half-inch increments (Wood, 2008).

Vertical Jump Test: This test measures the maximal height at which an athlete can propel themselves upward into the air (Vertical jumping, 2011).
CHAPTER II

REVIEW OF LITERATURE

The review of literature will be organized into two different sections. This is to help consolidate the specific research done on the different claimed benefits of using KT tape. The first section will go into detail on the research conducted to demonstrate the benefits and effectiveness of using KT tape for rehabilitation purposes, which includes joint/ligament manipulation and pain reduction. Section two of the literature review will discuss whether or not evident research has been conducted to support the claim that KT tape can be used to enhance performance.

**Rehabilitation Purposes of KT tape**

Kim (2004) executed a study on thirty post-stroke hemi-paretic patients with the objective of evaluating the application of KT tape on their upper and lower extremities on their function and balance. The subjects were randomly assigned to an experimental, taped with KT tape and therapeutic exercises, group or a control, just therapeutic exercises, group. The experimental group had KT tape applied, with no extension, to some of the major muscle groups of the upper and lower extremities on the affected side. The lower extremities included quadriceps femoris and tibialis anterior and the upper extremities included the biceps brachii and upward rotators of the scapula. Both groups participated in physical rehabilitation exercises three times a week for six weeks, but the specific exercises were not included in the study.

Kim (2004) evaluated the subject’s functional gait, dynamic balance, and walking speed before and after the intervention was implemented. The functional gait was
measured using the straight line walking test (SWT) while the subjects were blindfolded. Dynamic balance was measured using a Berg Balance scale and then walking speed was calculated using a 10 meter walking test (10MWT). Once the intervention was completed and after tests were evaluated, Kim determined that there were significant differences in the results of the SWT and 10MWT test in the experimental group (p<.05). The results of the control group showed that there were no significant differences between any of the three tests, but there were significant differences between the control and experimental groups in the BBS and 10MWT (p<0.05).

Kim (2004) concluded, after obtaining the results, that balance and walking ability can be induced by direct stimulation of the paralyzed extremities. It was determined that the application of the tape resulted in an improvement of muscle strength by exciting the gamma motor nerves in the desired skeletal muscles. The results showed that due to this aspect of KT tape it facilitated muscle activation in the non-paralyzed parts of the body, which led to gait symmetry and decreased weight bearing on the non-affected side. In summary, the results of the study showed that the application of KT tape to the paralyzed parts of a stroke patient will have a positive effect on them in the areas of typical asymmetric gait and walking speed.

Many years later, Parreira (2011) performed a systematic review to determine if there was any evidence, to date, that pointed towards KT taping being an effective rehabilitation tool. Parriera evaluated randomized, peer-reviewed trials that involved individuals with a musculoskeletal condition and each of the trials were required to incorporate an intervention involving KT taping that was compared to different intervention; sham taping/placebo, no treatment, exercises, manual therapy, or
conventional physiotherapy. The inclusionary outcome measurements incorporated pain intensity, disability, quality of life, return to work, and global impression of recovery. The systematic review found 12 randomized trials, 495 participants total, that fit all the inclusionary requirements. The review examined the effectiveness of KT taping on participants with: shoulder pain (two studies), knee pain (three studies), chronic low back pain (two studies), neck pain (three studies), plantar fasciitis (one study), and multiple musculoskeletal conditions (one study).

Parreira (2011) measured the methodological quality of the studies included in the review using a PEDro Scale score and found that the average score of all the studies was 6.1 points out of a 10 point scale. Parreira (2011) found that in about half of the studies KT tape had no beneficial effect on the participants, and in the other half of the studies KT tape had beneficial effects at reducing pain on the participants but the positive effects were not significant enough to validate the use in a clinical setting. In summary, Parreira’s (2011) systematic review found that that KT tape had no significant effects on a range of musculoskeletal conditions verse sham taping/placebo and active comparison therapy. It stated that if benefit was found it was too small to validate use in a clinical setting or the study was performed at too low of quality to be considered valid intervention.

With evidence on KT tape’s true effects still being unknown, Miller (2013) investigated the immediate effects of KT tape applied to the lateral gluteal and manipulations completed that targeted the lumbopelvic region in participants with unilateral patellofemoral pain syndrome (PFPS). PFPS affects up to 25% of the general population but is known as the most common overuse injury in runners (Miller, 2013).
Sports medicine clinics claim that 25-40% of the knee complaints that are presented to them by athletes are represented by PFPS. Miller (2013) recruited 18 total PFPS participants to test whether or not KT tape would have any beneficial effects. The 18 participants were randomly divided into three groups; kinesio taping, manipulation, or control taping. The groups consisted of 6 participants, which included 4 males and 2 females per group. The experimental kinesio taping group applied KT tape to the affected extremity’s hip in a way to facilitate the gluteus medius. The control kinesio taping group applied KT tape to the affected extremity in a way that it did not facilitate the gluteus medius. Finally, the manipulation group was not applied with any kind of KT tape, but rather given a lumbopelvic manipulation that was set up with the thrust of the hand of a KT tape practitioner on the participants affected hip.

Miller (2013) reported that before the participants had been assigned to a group they were asked to complete the Lower Extremity Functional Scale, visual analog scale (VAS) for pain at rest, after double-leg squat, step-up maneuver, and step-down maneuver, the Y-balance test, and squatting ROM. After they performed each test, they were randomly assigned to a treatment group and asked to repeat the same tests. Then they were asked to keep the KT tape on and returned after 3 days to perform the tests/exercises again. The results showed that the experimental KT tape group had significantly better Y-balance tests (p=0.02) and ROM when squatting (p=0.04) compared to the control taping and the lumbopelvic manipulation groups. The only other significant result that was found was that the experimental KT tape group and the lumbopelvic manipulation group were significantly better at double-leg squatting ROM performance after three days compared to the control KT tape group.
Miller (2013) concluded that, due to the significant results found in the experimental group, when KT tape is correctly applied to the gluteus medius, it will not only facilitate activation, but also improve postural stability and a double-leg squat. It was also concluded that including lumbopelvic manipulation before rehabilitation programs for PFPS will result in immediate improvement of these rehabilitation exercises. In summary, this study suggested that, in these participants, PFPS individuals should apply KT taping to the gluteus medius and include lumbopelvic manipulations to experience beneficial improvements in postural stability, knee ROM, and double-leg squat ROM.

Similarly, Donec (2014) investigated the effectiveness of the application method of KT tape at decreasing edema, postoperative pain, and improving knee range of motion (ROM) after a total knee replacement (TKR). The application of KT tape was done and observed during the early postoperative rehabilitation period of 94 patients after TKR surgery. The participants were randomly assigned to either the KT tape or the control group. The two groups were given the exact same rehabilitation program and procedures after surgery, but the KT tape group also was applied with KT tape throughout the rehabilitation process.

Donec (2014) applied two fanned strips of KT tape to the knee that was operated on to decrease edema and inflammation. The fanned strips had 4 separate strips connected at the proximal head of the tape. The proximal head of the first fanned strip was applied to the lateral side of the mid quadriceps with the fanned strips wrapping medially down the leg, behind the knee, and ended at the mid-calf. There was little to no tension applied to the tape during the application process and then rubbed to activate the
adhesive effects and stimulate the healing process. The second fanned strip was applied opposite of the first one, so it started at the medial side of the mid quadricep of the healing knee.

Donec (2014) found that the postoperative pain decreased significantly in both groups during the rehabilitation period. The KT tape group did show less pain, less intense and quickly subsided postoperative edema, and better knee extension compared to the non-taped group. These results showed that KT tape is beneficial at lowering postoperative pain, edema, and improving knee extension in TKR patients during the early phases of rehabilitation. In summary, this study demonstrates that KT tape is a safe and useful addition to the rehabilitation of TKR patients.

In this section of the review of literature, KT tape was evaluated to determine whether its application had beneficial effects on the rehabilitation process. In most of the studies that were reviewed, KT tape seemed to facilitate muscle activation in the areas it was applied and served as a beneficial additive to rehabilitation exercises. In one of the studies that was included in the literature review, it showed that after conducting a systematic review on 12 different studies, there was no solidifying evidence that proved that the application of KT tape benefited individuals going through rehabilitation. These conflicting results of the first section of the literature review reiterate the need for more research to be conducted in this area. The lack of research conducted on KT tape’s effect on performance, as well, becomes evident in the second section of the literature review.
Enhancement of Performance

In the study performed by Huang (2011), the effectiveness of elastic taping the triceps surae on 31 healthy adult participants while they performed a maximal vertical jump test was investigated. The researchers were optimistic that elastic taping to this area would result in an increase in muscle activity and jump height. The muscle fiber activity of each participant was tested by the use of electromyography (EMG) surface electrodes that were applied to the medial gastrocnemius, tibialis anterior, and soleus. The jump height was recorded by using the kinematic data that was collected from the reflector that was attached to the left and right calcaneus bones. Finally, the vertical ground reaction force (VGRF) was measured by using a force platform were the participants executed each jump.

Each time the participants came in they performed a baseline jump test, which included five jumps to get the maximal height, and this test served as his/her control group because they were not taped. Then they were randomly assigned to an Mplacebo or KT taping group, they rested for 30 minutes to avoid muscle fatigue, and then performed another five trials in the assigned experimental group. Once all the participants completed the test in all three groups, the results were analyzed using a repeated measures analysis of variance (ANOVA).

Huang (2011) found that the VGRF increased when the KT tape was applied even though actual vertical jump height remained relatively constant. The application of Mplacebo tape resulted in a decreased vertical jump height, but no difference in VGRF.
The EMG showed that there were no significant differences in muscle activity in the medial gastrocnemius, tibialis anterior, and soleus amongst either group.

In summary, this study found no significant evidence that suggested that the application of elastic, or KT, tape would improve vertical jump height. There was significant evidence that showed that the application of KT tape improved VGRF and EMG muscle activity compared to the Mplacebo tape. These results are very possible to be the result of the different specialized weaves and viscosity of each tape. Mplacebo tape design is to help with stabilization, protection, and restrict range of motion (ROM) and is most likely the reason why there were decreased results in this group (Bradyopadhyay, 2012). The results from this study are limited due to age, health criteria, and exercises performed by participants and cannot be applied to the population at large.

Similarly, Bicici (2012) tested the effectiveness of the use of different tapes on the functional performance of athletes with chronic inversion ankle sprains. Due to the fact that this type of injury is common in basketball players, the researchers recruited 15 male (18-22 years old) basketball players with this condition. A variety of functional tests were used on these participants to test their agility, endurance, balance, and coordination. The functional tests included a hopping test, single limb hurdle test, vertical jump test, standing heel rise test, the star excursion balance test (SEBT), and sportKAT (Kinesthetic Ability Trainer).

The participants performed all the functional tests in each of the four conditions: placebo tape, without tape, standard athletic tape, and KT tape. Each of the four conditions were separated by one week intervals for each participant. The application of
the different taping conditions varied depending on which tape was utilized that trial. When the participants were taped in the KT tape condition, pink colored tape was applied along the peroneus longus, black colored tape was applied to the peroneus brevis, and flesh colored tape was applied to the anterior tibiofibular ligament. The athletic taping application process included pre-wrap, anchors, stirrups, heel locks, and closure straps, which is the typical application process for an injured ankle. In the placebo taping condition, ‘I’ shaped athletic tape was applied to the anterior side of the ankle in an X-shape with a vertical connecting piece on each side of the X-shape.

The results of all the conditions were analyzed using a one-way ANOVA and a bonferroni correction was applied to correct for repeated testing. The results showed that the KT tape condition did not decrease any of the participants’ functional performances in any of the tests. There were no significant differences between any of the conditions in the SEBT functional test. The athletic taping and KT tape conditions resulted in faster performance times in the single limb hurdle test compared to the other two conditions. The athletic taping condition resulted in a decreased functional performance in the standing heel rise test and the vertical jump test compared to the other conditions. In conclusion, this study performed by Bicici (2012) found that using KT taping ultimately has no negative effects on functional performance in these participants and resulted in improvements in a few of the functional tests.

Working off of Bicici's study, Nakajma (2013) examined whether the application of KT tape had an effect on vertical jump and dynamic postural control in 52 (28 males and 24 females) healthy young (age: 22.12±2.08) individuals. These individuals were free of any ankle or lower extremity problems and randomly assigned to one of two groups:
the experimental group (KT tape with tension) or the control group (KT tape without tension). Both groups were taped for a lateral ankle sprain, the main difference was the tension of the tape. The tension of the tape is said to be the key in allowing it to facilitate beneficial effects to the targeted area and why the no tension group is said to be the control.

Nakajma (2013) had the participants in each group go through a single leg vertical jump test on a VertiMetric and perform the Star Excursion Balance Test (SEBT) to evaluate dynamic postural control. Each participant performed a baseline vertical jump and SEBT before the application of either the “real” or the “sham” KT taping. The groups were then evaluated in each testing trial immediately after the application of the appropriate KT taping, then told to wear the tape for 24 hours, and return to the facility to be re-evaluated.

Nakajma (2013) discovered that the results of this study added to the mixed results of previous studies done on KT tape. The results showed that the application of KT tape on the ankle of these healthy, young participants was ineffective at increasing or decreasing vertical jump height. The “real” application of KT taping did result in certain directional increases in dynamic postural control in the female participants at the 24-hour follow-up reevaluation. In summary, this study was unable to demonstrate KT tape as either helpful or inhibitory of ankle movement in these participants. The study, like the previous studies, demonstrated the need for further testing and research in regards to the use of KT tape.
Finally, Drouin (2013) performed a literature synthesis on KT tape to determine athletic-based performance in healthy, active individuals. The inclusionary criterion for this study were healthy, human subjects, performance-based outcomes, experimental group using KT tape, control group not using KT tape, published after January 2000 in peer-reviewed journal in English, and they could be literature reviews, randomized controlled trials, cohort studies, and cross-sectional studies.

Drouin (2013) used MANTIS, Cochrane Library, and EBSCO to research for inclusionary articles and only found ten that met the proper criteria for this literature synthesis. Seven of the included articles showed that the application of KT tape had a positive effect in at least one of the athletic-based performance test that was measured. The lack of homogeneity of the studies showed to be a major limitation at providing solid evidence to support the claims of KT tape to be beneficial at athletic-based performance.

The review of the literature on whether the application of KT tape on individuals would attribute to enhancement of performance in individuals suggested that there is still a lack of evidence to clearly support this claim. Even though there were significant differences found between KT tape and control, e.g. VGRF and EMG activity, in some of the literature, there isn’t enough consistency and too many of the same limitations between the experimental designs to support them with confidence. Contrary to this, there is also no evidence that shows that it hinders athletic performance either.

**Conclusion**

There is a major need to perform more research on these two claims of KT tape to justify the use of it by healthcare professionals or athletes. The conflicting results of this
literature review just confirms the known fact that KT tape is still a new concept/product and that the continuation of testing on it is necessary to determine if it truly is able to support the claims that it has beneficial rehabilitation and sports performance effects when applied correctly.
CHAPTER III

METHODOLOGY

The review of literature clearly demonstrated that there is a lack of research that has been performed in the area of KT tape's effect on sports performance. In the hopes to expand on some previous studies, I performed a study to evaluate the effects of KT tape applied to the triceps surae of each participant's right and left legs at enhancing sports performance, specifically in the areas of vertical jump and shuttle run performance.

Participants

I recruited the participants for this study via email and phone requests. The target audience was the Illinois College Women's Basketball Team, participants ranged from 19-22 years of age. I did not reveal to the participants what the purpose of the study was until after the third day of testing as to avoid any bias in the results of the tests that would be performed later on. The participants were informed during the recruitment phase that the study was completely voluntary and if at any point in the study the participant did not want to continue it would be stopped immediately.

Each participant signed an informed consent, volunteering her service to the study, knowing she was able to stop at any point during the study if she was uncomfortable or in any type of pain/discomfort. I asked each participant a series of questions to collect demographic characteristics and any exclusionary characteristics. Refer to the Appendix D to view the evaluation sheet used to assess each athlete and the questions that were included in the introductory phase. Questions were asked to determine whether or not the participant had a pre-existing injury or medical condition.
that would inhibit the participant from performing any of the exercises and therefore be an exclusionary factor. If the athlete had a medical condition or exclusionary injury, pertaining to the lower extremities and back, I would excuse her from the study. I, also, informed the athlete that she could withdraw from the study at any time if she felt uncomfortable.

**Instructions**

The participants were asked to come to the Bill Merris Gymnasium in Bruner Fitness Center at Illinois College one participant at a time to avoid any competition that might take place if another participant was present and cause the individual to perform better or worse, ultimately skewing the results. Before any exercise was performed or data was collected, I revealed what the athlete was going to be doing during the study. The hypothesized result or main purpose of the study was not revealed to the participants in order to avoid biased results. I used deception as to avoid this bias, but would reveal the true purpose of the study at the end of all the testing with a debriefing statement (Appendix C). The deception was that I told the participants that the purpose of the study was to test the adhesive effects of different athletic tapes during sports performances.

Once the formalities were properly executed, the participants were instructed to go through a short warm-up in order to promote performance and prevent injury during the study. The short warm-up included two laps around Bill Merris Gymnasium at Illinois College and a dynamic stretch. The dynamic stretch was performed on one half of the court and included walking toe touches, quadricep stretch walking, side lunges (switching sides after each lunge), forward lunges, and walking knee hugs. The participants were
instructed to start at the baseline, perform one stretch while walking to half court, then
turn around and perform a new stretch while they walked back to the baseline. The
athlete repeated this process until she performed all five stretches.

Once the participant was properly warmed-up, they were randomly assigned to
the first of three treatment variables and then would perform both exercise tests, vertical
jump and shuttle run. The three treatment variables were taping with pink athletic tape
(Mueller Sport Care, USA), pink KT tape (3B Tape, American 3B Scientific, USA), and
control or no tape. These treatment variables were each assigned a number 1-3, 1 =
placebo or athletic tape, 2 = KT tape, and 3 = control or no tape, and the participant was
instructed to draw one of these numbers out of a cup to determine the order. For example,
if a participant drew 2 first, the researcher would properly apply the KT tape and instruct
the participant to go through the vertical jump test and then the shuttle run test. The
participant would then be done for the day. The following day, the participant would
draw another number; I would apply the proper treatment, and instruct the athlete to go
through both of the tests. The participant would then be free to go and the same process
would be repeated the next day. After the 3rd and final day of testing, the participant
would be told that they have completed the study and be given a debriefing statement.
The participant would be instructed that they could contact the researcher or the
researcher's advisor if they had any questions concerning the study.

Assessment

The taping process focused on the triceps surae of the right and left lower leg of
each participant to promote performance in the exercises to come (Huang, 2011). The KT
and placebo tape were both applied in the same manner. The participant was instructed to lay down on a training table in the prone position with their legs hanging off the table just below the knee (Bastholt, 2014). This allowed for a stretch to be applied to the desired muscles and skin. The tapes were measured using the length of each athlete’s leg to determine how much the researcher needed to cut off of the roll of KT tape or athletic tape. Then the proximal head of the tape was applied to the surface of the calcaneus bone on the sole of the foot with the subject in a relaxed prone position (Haung, 2011). The proximal head of the tape was then adhered to the bottom of the foot, after the ends were rounded, and up to the Achilles tendon while the foot was dorsiflexed and then split in half, in a Y-shape, for the application to the rest of the leg (Kase, 2005). Then, the two distal heads of the Y-shaped tape were stretched to 25% and then attached following the soleus muscle and ended on the surfaces of medial and lateral gastrocnemius muscles below the knee joint, respectively (Huang, 2011). Once the application of the tape was completed, the tape would be rubbed to ensure the activation of the tapes adhesiveness (Bastholt, 2014). The opposite leg would then be taped in the same manner. The application of KT tape to the triceps surae in this manner provided support and stability without restricting the body’s natural range of motion (Kase, 2013).

Once the participant had been assigned a treatment variable and the proper steps of application were taken, I would have the participant perform a vertical jump test using a Vertec. A Vertec is a common apparatus used for testing vertical jump height. It has a steel frame base and pole with horizontal vanes toward the top of the pole that are measured in half-inch increments (Wood, 2008). Vertical jump height is determined by how many vanes are rotated out of position by the hand of the participant. The participant
was allowed three trials during each vertical jump test, standard for vertical jump testing, and the top height was recorded. They were instructed to optimize a counter movement jump from a static position, with feet shoulder width apart, and using both legs to propel themselves upward.

Once they completed the three jumps, they were allowed to move onto the shuttle run test. The shuttle run test was performed on the same basketball court that the dynamic stretch occurred. For the shuttle run, the participants were given these instructions: Start at the taped starting line, stand in a staggered stance with her back foot on the pad of the Brower Timing System, and to go when she was ready because the time would automatically start when she released her foot from the pad. She would then run 29.5ft where two tennis balls are sitting on the ground 2ft away from each other, pick one up, turn and pivot, run back to the start line, set the tennis ball down on the start line, turn and pivot, run back to the second tennis ball, pick it up, turn and pivot, and run all the way through the start line and passed the laser on the automatic timing system to stop the time. They were instructed to complete this task as quickly as possible and that once they were done I would record the time on a piece of paper (Appendix D). The participant only performed the shuttle run once in each treatment variable.

Once each participant completed both the vertical jump and the shuttle run agility test within each of the three treatment variables, they were free to leave. They were given lead researcher, EIU kinesiology and sports studies graduate student, Holly Wohltman’s contact information in case they had any further questions or wanted to know the results of the study. The data was then examined and analyzed to determine if the original hypothesis was supported or denied.
Figure 1. Applied KT tape
Figure 2. Adjusting the Vertec
Figure 3. Counter Movement Jump
Figure 4. Shuttle Run
Data Analysis

Descriptive statistics (mean ± SD) for all demographic variables were calculated, see Table 5. Most participants had a normal BMI level, except one participant who was slightly overweight. The results from the vertical jump and shuttle run tests, in each treatment variable, were collected and analyzed in Figure 5. Due to the fact that the participants in the study were the same for all 3 conditions, a one-way ANOVA was preformed IBM SPSS Statistics for Windows Version 20.0 to determine if there were any significant differences between the treatment variables.
CHAPTER IV

RESULTS

The results of each of the eleven participant’s vertical jump and shuttle run tests in each of the three treatment variables were analyzed using various statistical tests and displayed using tables and figures in this chapter. The statistical tests that were optimized included mean, standard deviation, and two one-way ANOVA tests. Each table and figure includes descriptions that elaborate on what is displayed in each.

Table 1 displays the descriptive statistics of all the participants during the vertical jump test. The descriptive variables include standard deviation, mean, standard error, 95% confidence interval for mean, minimum jump height, and the maximum jump height of each of the treatment variables.

Table 1. Vertical Jump Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval for Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Athletic Tape</td>
<td>11</td>
<td>19.2727</td>
<td>1.58688</td>
<td>.47846</td>
<td>18.2066</td>
<td>20.3388</td>
<td>17.00  22.00</td>
</tr>
<tr>
<td>KT tape</td>
<td>11</td>
<td>19.0909</td>
<td>1.99773</td>
<td>.60234</td>
<td>17.7488</td>
<td>20.4330</td>
<td>16.50  23.50</td>
</tr>
<tr>
<td>Control</td>
<td>11</td>
<td>19.6364</td>
<td>1.39805</td>
<td>.42153</td>
<td>18.6971</td>
<td>20.5756</td>
<td>17.50  22.00</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>19.3333</td>
<td>1.64253</td>
<td>.28593</td>
<td>18.7509</td>
<td>19.9158</td>
<td>16.50  23.50</td>
</tr>
</tbody>
</table>
The vertical jump means of the participants in each of the three treatment variables were compared using a one-way ANOVA. No significant difference was found (F (2, 30) = .301, p > .05). The participants' vertical jump performance did not differ significantly between the three treatment groups. When participants were taped with athletic tape they had a mean score of 19.27 (sd = 1.59). When participants were taped with KT tape they had a mean score of 19.09 (sd = 2.00). When participants were not taped they had a mean score of 19.64 (sd = 1.40).

Table 2. Vertical Jump ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1.697</td>
<td>2</td>
<td>.848</td>
<td>.301</td>
<td>.742</td>
</tr>
<tr>
<td>Within Groups</td>
<td>84.636</td>
<td>30</td>
<td>2.821</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>86.333</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 displays the descriptive statistics of all the participants during the shuttle run test. The descriptive variables include standard deviation, mean, standard error, 95% confidence interval for mean, minimum shuttle run time, and the maximum shuttle run time of each of the treatment variables.

Table 3. Shuttle Run Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval for Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>11</td>
<td>10.1509</td>
<td>.29211</td>
<td>.08807</td>
<td>9.9547</td>
<td>10.3472</td>
<td>9.82</td>
</tr>
</tbody>
</table>
The shuttle run means of the participants in each of the three treatment variables were compared using a one-way ANOVA. No significant difference was found (F(2,30) = .053, p > .05). The participants' shuttle run performance did not differ significantly between the three treatment groups. When participants were taped with athletic tape they had a mean score of 10.20 (sd = .414). When participants were taped with KT tape they had a mean score of 10.13 (sd = .553). When participants were not taped they had a mean score of 10.15 (sd = .292).

Table 4. Shuttle Run ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.020</td>
<td>2</td>
<td>.010</td>
<td>.053</td>
<td>.948</td>
</tr>
<tr>
<td>Within Groups</td>
<td>5.622</td>
<td>30</td>
<td>.187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5.642</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5 shows the mean and standard deviation of all the participant’s demographic characteristics. After calculating the BMI of each participant, it was discovered that most participants had a normal BMI level, except one participant who was slightly overweight.

Table 5. Participants’ Demographic Descriptive Statistics

<table>
<thead>
<tr>
<th>Height (inches)</th>
<th>Weight (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.91±2.26</td>
<td>67.09±9.57</td>
<td>22.5±2.55</td>
</tr>
</tbody>
</table>
Table 6 shows the mean and standard deviation of all the athlete’s treatment variables within each exercise. The vertical jump performance of each participant was measured using inches and the shuttle run performance was measured using seconds. The results show that the mean and standard deviation of each treatment variable within each exercise test were very similar to one another.

Table 6. Treatment Variable Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Athletic Tape</th>
<th>KT tape</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical Jump</strong></td>
<td>19.27±1.59</td>
<td>19.09±2.00</td>
<td>19.64±1.40</td>
</tr>
<tr>
<td>(inches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shuttle Run</strong></td>
<td>10.19±0.41</td>
<td>10.13±0.55</td>
<td>10.15±0.29</td>
</tr>
<tr>
<td>(seconds)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 5 gives a visual of the distribution of the vertical jump data collected from each participant in all three of the treatment variables. Jump group 1 represent the participants taped with athletic tape, group 2 is KT tape, and 3 is the control or no tape group.

Figure 5. Visual Distribution of Vertical Jump Data
Figure 6 gives a visual of the distribution of the shuttle run performance data collected from each participant in all three of the treatment variables. Shuttle run group 1 represent the participants taped with athletic tape, group 2 is KT tape, and 3 is the control or no tape group.

Figure 6. Visual Distribution of Shuttle Run Data
CHAPTER V

DISCUSSION

The purpose of this study was to determine if the application of KT tape to the triceps surae of female basketball players would enhance their sports performance in the areas of vertical jump shuttle run performance. The current study showed that the claim that KT tape is beneficial at enhancing sports performance is false. This correlated with my hypothesis because I believed that the application of KT tape to the triceps surae would have no to little beneficial effect at enhancing vertical jump height or shuttle run agility in the athletes I tested. The evidence presented in this study contradicts the claims that KT tape is effective at enhancing sports performance in athletes. The p-values found when comparing the treatment variables in the vertical jump (p=0.742) and shuttle run (p=0.948) test show that there were no significant differences amongst them. This demonstrated that, in these particular participants, KT tape had no effect on enhancing vertical jump height.

Athletic tape has a strong adhesive force when it is applied to a certain area of the body and it causes the mobility of this section to be restricted (Huang, 2011). The design of athletic tape is to stabilize and support the body segment that it is being applied to. It was perceived that this could be a negative factor on performance when it was applied to the triceps surae of the participants and hinder their performance, but that was not the case in this study. The participants performed similarly across the board in the different treatment variables, which showed that there was not a significant difference between taping with athletic tape, KT tape, and not taping at all.
Even though the design of KT tape is supposed to help promote enhanced performance that was not the case in this study. This result supported the null hypothesis. The two main studies that had similar design to this study had contradicting results; one supported the findings of this study while the other contradicted the findings. Chen-Yu Huang did the contradicting study in 2011 and focused on the effects of KT tape to muscle activity and vertical jump performance in healthy inactive people. This study showed that muscle activity increased immediately following the taping of the triceps surae of the participants (Huang, 2011). The literature synthesis that Drouin (2013) conducted on the effects of KT tape on athletic-based performance outcomes in healthy, active individuals, found that evidence to support this KT tape is lacking significantly. There were various significant differences found in this synthesis, but due to the limitations and inconsistency of the studies it was determined that they were not enough to prove that KT tape has performance enhancing attributes. A study performed by Lins (2012), went into the neuromuscular effects of KT tape applied to the lower limbs of subjects and found that there are no significant neuromuscular effects during performance.

It is argued that any increase in performance when KT tape is applied is credited to psychological effects (Vercelli, 2013). If an individual believes wearing KT tape will enhance performance and their performance increases while wearing it, they will continue wearing it because psychologically they believe they will be better with it on. Since evidence is clearly lacking on the true effectiveness of KT tape at enhancing sports performance and there are little to no research done on the psychological aspects of KT tape application, more studies need to be done to test these areas.
A limitation found within the study was the small subject size. Due to the fact that the study only had 11 participants, it is hard to make a concise conclusion when one is talking about the effectiveness of KT tape at improving sports performance on everyone. More participants would have made the results more valid. Another limitation is the fact that I personally applied the KT tape to the individuals and not an athletic trainer or physical therapist who was certified in Kinesio taping. I personally researched taping techniques, viewed demonstration videos, and practiced the taping technique with a certified athletic trainer who has worked with KT tape before, but am not certified in KT taping myself. This could be viewed as a limitation. Also, due to the lack of a controlled environment some girls had to perform when there were other people around them. It was my hopes to have them perform while there was no one around so that environmental influences could be avoided. It is good to note that a controlled environmental setting would have been ideal, but was not attained during this study. Another environmental limitation, was that I had no control on what the participants did in between the three days that I tested them. Some of the girls worked out before coming in to be tested and claimed to be sore from this. This muscle fatigue prior to testing could have led to negatively skewed results based on which treatment variable they were assigned that day.

Another limitation to the study was the duration of time the participants had the KT tape applied to them. Once the participants were applied with the KT tape, they were told to perform the exercises and then were allowed to remove the tape. According to Slupik (2007), muscle motor units increase maximally after 24 hours of wearing the KT tape. If this is accurate, then the tape did not have the proper amount of time to truly activate the muscle motor units and work properly. The participants were randomly
assigned to the order of which treatment variable they received each day and it was
discovered that in the shuttle run, eight of the eleven participants performed their best
times on the third day. Four participants were wearing KT tape, three were wearing
athletic tape, and one had no tape. Since shuttle run performance was the best on the third
day for a majority of the participants it would be necessary determine if this aspect or the
applied treatment variable had an effect on enhancing performance for this day. The last
limitation that was found during the study, was the fact that the triceps surae are not the
only muscles that are activated during activities such as jumping and running. The results
might have been different if the incorporation of the hip and knee extensors were
included in the taping process.

KT tape is most commonly used to treat athletic injury or to limit pain in athletes,
but evidence is lacking to support its effectiveness at enhancing sports performance. This
should be taken into consideration before the use of this tape and healthcare providers
should educate themselves, coaches, and athletes on the facts of KT tape. More studies
need to be done in this area to produce more valid evidence on whether or not it can truly
be beneficial at enhancing sports performance.

The current study provides a solid foundation for more research to be conducted
off of it in order to truly understand KT tape’s effect on performance. The results show
that the KT tape is ineffective at enhancing vertical jump and shuttle run performance in
women’s collegiate basketball players, but this is such a specific population that it cannot
be correlated to the general population. In order to associate these results with the general
population or other sports teams, a larger subject size would be necessary. Expanding the
number of participants, sports involved, and looking into both genders when testing KT
tape, will lead to more solidifying results on what the true effects are of KT tape. Also, incorporating a controlled environment where the participants can perform the exercises will dismiss the possibility for biased results to arise. These simple adjustments to the current study’s limitations would lead to more accurate findings and finally be able to shed some real light on the effects of KT tape on performance.

**Conclusion**

According to the results collected from the participants in this study, KT tape has no significant effect on sports performance in the areas of vertical jump height and shuttle run agility. The conclusion that was drawn supports the original null hypothesis of the study that there would be no effect on performance with the application of KT tape to the triceps surae. Due to the limitations and small subject size, more studies need to be performed in this area to truly validate these findings and determine if this population correctly represents the effectiveness of the application of KT tape on all.
REFERENCES


APPENDICES
APPENDIX A

CONSENT TO PARTICIPATE IN RESEARCH

The Adhesive Effects of Athletic Tape on Sports Performance: Pertaining to Vertical Jump and Shuttle Run Agility Performance

You are invited to participate in the thesis research study conducted by Holly Wohltman, from the department of Kinesiology and Sports Studies at Eastern Illinois University. Your participation in this study is entirely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

Purpose: The purpose of this study is to determine the adhesive effects of the application of different athletic tapes in sports performance, focusing on the areas of vertical jump and shuttle run agility performance in Illinois College Women’s Basketball players (18-22 years).

Procedures: If you volunteer to participate in this study you will be asked to:

Perform multiple vertical jump tests and shuttle run agility tests. To begin the test you will be asked to weigh yourself and self-report your height. Then you will go through a short warm-up consisting of a lap around the King Field House indoor track and a dynamic stretch. You will then be assigned to an order of what treatment variable you will participate in first, second, and third. The next step will consist of you performing a vertical jump test and a shuttle run agility test. The order at which these tests come first will change each time you change treatment groups. Once you are finished with all three of the treatment variables you will be free to leave.

Potential Risks and Discomforts: The potential risk for injury in this study is very slim. The activities being performed are not particularly dangerous to individuals who are familiar with exercise. If an injury does occur, the study will be stopped immediately and you will not be asked to proceed.

Potential Benefits: Participating in this research study will help to determine which athletic tape application is more beneficial at helping to improve sports performance. You as an athlete might not benefit directly from the findings of this study but your participation will benefit future athletes and athletic trainers who are questioning which athletic tape has more adhesive abilities.

Confidentiality: Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of only allowing the lead researcher, Holly Wohltman, and faculty research personnel, John Storsved see the recorded
information. Any personal information that is obtained from you will be kept with the lead researcher in a secure location.

**Participation and Withdrawal:** Participation in this research study is voluntary and not a requirement or a condition for being the recipient of benefits or services from Eastern Illinois University or any other organization sponsoring the research project. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits or services to which you are otherwise entitled. There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

**Investigators:** If you have any questions or concerns about this research, please contact:

- John Storsved via phone (217-621-8797) or email (jrstorsved@eiu.edu)
- Holly Wohltman via phone (217-273-6510) or email (hawohltman@eiu.edu)

I voluntarily agree to participate in this study. I understand that I am free to withdraw my consent and discontinue my participation at any time. I have been given a copy of this form.

____________________________
Printed Name of Participant

____________________________
Signature of Participant Date

I, the undersigned, have defined and fully explained the investigation to the above subject.

____________________________
Signature of Investigator Date
January 21st, 2015

I, Lora Westling, give Holly Wohltman, graduate student at Eastern Illinois University, permission to use Illinois College Women's Basketball team as subjects for her thesis research. I have discussed the procedures and purpose of this study with Ms. Wohltman and found them to be safe for the participation of my athletes. I understand that the use of the deception/debriefing process will be used in this study and believe that it will not be harmful or negatively effect the psychological well being of my athletes.

Sincerely,

Lora Westling

Illinois College Head Women's Basketball Coach
APPENDIX C

Debriefing Statement

Thank you for your participation in the thesis research of Holly Wohltman, Kinesiology graduate student at Eastern Illinois University. The true purpose of this research was not to test the adhesive effects of athletic tape, but rather to test the effects of KT tape on sports performance; pertaining to vertical jump and shuttle run agility. It was required for the experiment to deceive you about the true purpose of the study so that the researcher could collect accurate data without the influence of bias to skew the results. It was hypothesized by the researcher that the application of KT tape would have no effect on sports performance in the participants. Your participation in this study will prove to be vital at determining whether or not the researcher can accept or deny her proposed hypothesis.

The researcher will present the final results of this study during the oral defense of her thesis research. Participants are welcome to attend the oral defense, which will be determined at a later date, if they are interested in finding out the results.

If you have any additional questions regarding this research, please contact Holly Wohltman via email (hawohltman@eiu.edu) or phone (217-273-6510) or John Storsved, chair of thesis committee, via email (jrstorsved@eiu.edu).
APPENDIX D

PARTICIPANT EVALUATION SHEET

Evaluation Sheet

Age: Height: Weight:

Gender: BMI:

Have you ever endured any injuries that affect you to this day while exercising? (For example: a back/knee injury that prevents you from doing certain exercises)

Medical Issues--heart condition, asthma, diabetes or any other condition I should know about before performing an exercise test?

Measurements:

<table>
<thead>
<tr>
<th></th>
<th>1--TAPE 1</th>
<th>2--TAPE 2</th>
<th>3--CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Jump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(inches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shuttle Run</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(seconds)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>