

THE ACUTE EFFECTS OF KINESIOTAPE ON THROWING VELOCITY IN
COLLEGIATE BASEBALL ATHLETES

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
2013

CALIFORNIA UNIVERSITY of PENNSYLVANIA
CALIFORNIA, PA

THESIS APPROVAL

Graduate Athletic Training Education

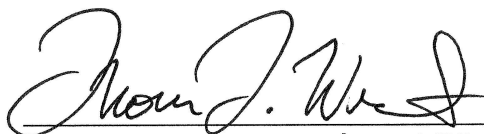
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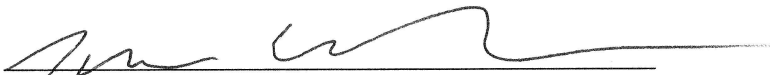
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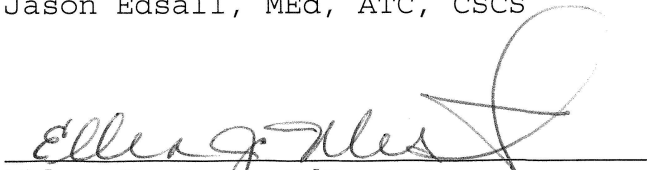
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ACKNOWLEDGEMENTS

I would like to sincerely thank my family; especially my father Bob, mother Diane, and brother Andrew for their continued love and support; without it, this all would not be possible.

I would also like to thank my thesis chair: Dr. Thomas F. West, as well as the rest of my thesis committee: Mr. Jason Edsall, and Dr. Ellen West for their time and commitment in helping me achieve this accomplishment. I would also like to thank Ms. Erin Podroskey for her assistance and cooperation between our studies.

TABLE OF CONTENTS

	Page
SIGNATURE PAGE	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	vii
INTRODUCTION	1
METHODS	4
Research Design	4
Subjects	4
Preliminary Research.	6
Instruments	7
Procedures	7
Hypothesis	7
Data Analysis	9
RESULTS	10
Demographic Data	10
Hypothesis Testing	11
Additional Findings	12
DISCUSSION	14
Discussion of Results	14
Conclusions	17
Recommendations.	18

REFERENCES	19
APPENDICES	22
APPENDIX A: Review of Literature	23
APPENDIX B: The Problem	38
Statement of the Problem	39
Definition of Terms	39
Basic Assumptions	40
Limitations of the Study	40
Delimitations of the Study	41
Significance of the Study	41
APPENDIX C: Additional Methods	42
IRB Approval California University of PA (C1) .	43
Individual Data Collection Sheet (C2)	45
Taping Protocol (C3)	47
Spec Sheet for Radar Gun (C4)	49
REFERENCES	51
ABSTRACT	55

LIST OF TABLES

Table	Title	Page
1	A Repeated Measures ANOVA Examining the Acute Effect of Kinesiotape on Throwing Velocity	12
2	A Mixed-Design ANOVA Examining the Acute Effect of Kinesiotape on Throwing Velocity by Position . . .	13

LIST OF FIGURES

Figure	Title	Page
1	Pectoralis Major Inhibition Taping	52
2	Rhomboid Major Facilitation Taping	52
3	Radar Gun Specifications	54

INTRODUCTION

Kinesiotape is among the most popular and fastest growing modalities in the sports medicine realm.

Kinesiotape is an elastic cotton tape with heat activated, acrylic based adhesive. It is latex free and has been reported to stretch 40%-60% of its resting length.¹ The prevalence and utilization of kinesiotape has seen a significant spike and evidence based research has also followed suit, and has begun examining practical applications as well as the validity and clinical effectiveness.

Numerous researchers have observed kinesiotape's use in the treatment of myofascial pain, lymphatic drainage, range of motion increases, and proprioception.¹⁻¹⁷ For instance, in a study by Kalter et al,¹⁷ kinesiotape was found to be an effective means of improving outcomes associated with pain relief and functional improvement associated with SAIS (subacromial impingement syndrome). Though there have been published articles regarding the effectiveness of kinesiotape for SAIS, inadequate examination of methods has been recognized.

The effectiveness of kinesiotape on muscular strength at various anatomical structures has been investigated in clinical research,¹⁹⁻²⁴ but few have looked specifically at the shoulder and specifically the overhand throw. In the athletic realm, baseball is a sport which can benefit from improvement to muscular strength increasing throwing velocity. The increase in throwing velocity can be useful not only to the pitching positions, but others as well since timing of throws is a large part of the sport. Examining muscular strength/velocity of the glenohumeral joint, which is inherently dynamic and commonly injured, can have practical clinical outcomes.

The shortcomings in literature have shown the need for research relating to muscular strength and throwing velocity and if kinesiotape may impact these performance measures. Previous research has demonstrated a potential effect. As research by Aktas and Baltaci demonstrated, kinesiotape had a positive effect on knee muscular strength at 180°/s PT values by isokinetic measures.²⁵ In light of this encouraging research seen within the lower extremity, there is a need for upper extremity testing which could potentially report similar positive outcomes.

Research examining the effect of kinesiotape on athletic performance would be useful in guiding the

athletic trainer as treatment decisions are made.

Therefore, the purpose of this study is to examine the effects of kinesiotape on throwing velocity of NCAA Division II collegiate baseball and softball players.

METHODS

The primary purpose of this study was to examine the effect of kinesiotape on throwing velocity as it relates to athletic performance. This section will include the following subsections: research design, subjects, instruments, procedures, hypotheses, and data analysis.

Research Design

This research utilized a quasi-experimental, within subjects, repeated measures design. The independent variable was taping condition. This condition had three levels; no intervention (control), placebo tape, and kinesiotape. The dependent variable was throwing velocity as measured by the radar gun.

Subjects

The subjects used for this study were approximately 30 volunteer male and female student athletes from California University of Pennsylvania, with a minimum requirement of 15 volunteers needed. Varsity level athletes will be

preferred and subject height, weight, age, position in sport, and throwing arm dominance will also be recorded. All subjects will have been screened for disability or dysfunction as it relates to performing this study. Subjects were excluded if they were under the age of 18, not medically cleared to participate in their sport or had a condition that could affect their performance in this study.

Each subject will be required to participate in one 45-minute testing session. All subjects in the study will sign an Informed Consent Form (Appendix C2) prior to participation in the study. The subjects will also attend an information meeting detailing the purpose, procedure, and risks involved in volunteering. After subjects have been obtained, a practice session will be held for the volunteers to become familiar with the research set up and data collection measures. The subjects will have the option to opt out of the study at any time. The study was approved by the Institutional Review Board at California University of Pennsylvania (approval #12-042) prior to any data collection. Each participant's identity will remain confidential and will not be included in the study.

Preliminary Research

There will be a preliminary study conducted with this research project. Up to 3 subjects will be used to review the protocol. The subject will perform the warm up procedure as described in the procedure section. They will also get 10 warm up throws just as the participants would be allotted. To keep in accordance with the procedure of the research, the preliminary researchers will also have just finished 5 submaximal accuracy throws for another study.

They will then be asked to complete 5 successive throws from a distance of 60 ft 6 in (18.44m), with a 1-minute rest period between throws. The preliminary researchers will throw with 3 different interventions just as the subjects will be asked to. They will perform five 5 throws with a randomized intervention order. They will also throw at a designated target and their velocities will be recorded. The researcher will be looking for the subject's ability to understand directions, the amount of time used to complete the tasks and if the warm-up protocol before service testing is accurate. Data will be collected on the data collection sheet (Appendix C3).

Instruments

Instruments used within the study will include a speed radar gun (Model #1235982), a tape measure to determine the appropriate distance of 60 ft 6 in (18.44m), a netting which the subjects will throw into, official NCAA standard size collegiate baseballs and softballs, and specific taping techniques for muscular strength. These techniques will include a pectoralis major inhibition taping (Figure 1) incorporation with a rhomboid major facilitation taping (Figure 2) procedure.

Procedures

The researcher applied and obtained approval from the IRB at California University of Pennsylvania before any research was conducted. Subjects completed an informed consent in their first meeting with the research.

The testing protocol will follow the example as set forth by Carter, Kaminski, Douex Jr, Knight, and Richards.²⁶ Subjects were instructed to complete a warm-up of 10-15 minutes, focusing on baseball specific stretching of the shoulder musculature as well as a cardiovascular component. This took place before the subjects participated in a

similar study involving kinesiotape and its effects on throwing accuracy. The subjects were only asked to partake in the warm up protocol once, therefore they were not asked to fulfill this procedure a second time in any given session. Optimal throwing velocity was assessed over a distance of 60 ft 6 in (18.44m), the distance from the center of the pitcher's mound to home plate in a standard intercollegiate baseball field using official NCAA standard size collegiate baseballs and softballs. Subjects threw in a temperature controlled enclosed room to rule out and effects from the elements. Subjects threw from flat ground to a designated target with a catching net as a background. Participants were allowed to perform 5 warm up throws, for verification purposes, the radar gun also recorded each warm up throw to ensure the functionality of the equipment. Each subject was given 5 throws with a 1-minute rest period established between throws. Any throws out of the range of the target or radar gun were discarded. The highest speed, measured in kilometers per hour (kph) was deemed as maximal throwing velocity and utilized as the test statistic.

Taping intervention application was applied using a counter balance order. Each taping intervention was assigned a number, 1-no taping procedure applied, this will also be known as the control in the study; 2-placebo tape,

and 3-kinesiotape. This was necessary in order to prevent any biasing factor from occurring. In addition, all of the tapings were applied by the same researcher to prevent any crossover effect.

Hypothesis

The following hypothesis was constructed on previous research and the researcher's intuition based on a review of the literature.

1. Kinesiotape will have no significant difference on throwing velocity as compared to the control, and placebo taping groups.

Data Analysis

All data will be analyzed utilizing SPSS version 18.0 for Windows at an alpha level of 0.05. The research hypothesis will be analyzed using repeated measures ANOVA.

RESULTS

The primary purpose of this study was to examine the effect of kinesiotape on throwing velocity as it relates to athletic performance on three levels. The three variables were a control with no tape, a placebo tape (Elasikon®), and kinesiotape (Kinesio® Tex Gold™). Sixteen male subjects volunteered to be a part of this study. Each informed subject completed a dynamic warm up protocol at each session prior to testing. Each subject completed five trails under each condition; and the greatest velocity measured under each variable was deemed optimal throwing velocity for that condition. This section will include the following subsections: Demographic Information, Hypothesis Testing, and Additional Findings.

Demographic Information

Subjects used in this study (N=16) were volunteers from California University of Pennsylvania's varsity baseball team. The subject's were all at least 18 years old at the time of testing. All subjects were screened for disability or dysfunction as it relates to performing this

study. The playing positions of the subjects were mixed with three pitchers, and 13 classified as fielders (infield, outfield, and catcher).

Hypothesis Testing

The following hypothesis was tested in this study. An $\alpha < .05$ was used for statistical testing.

1. Kinesiotape will have no significant difference on throwing velocity as compared to the control, and placebo taping groups.

Conclusion: To test the hypothesis, each subject's greatest velocity (best performance) was recorded for each of the three taping conditions. These include the no tape (control), the placebo tape, and the kinesiotape. A repeated measures ANOVA was calculated to compare the velocities for the subjects under each condition. Table 1 illustrates the mean velocities for each condition.

A one-way repeated measures ANOVA was calculated comparing the velocities of subjects under three different taping conditions: no tape, placebo tape, and kinesiotape. No significant effect of taping condition was found

($F(2,28) = .64$, $p > .05$). No significant difference exists among no tape ($m = 120.8\text{kph}$, $se = 2.13$), placebo tape ($m = 123.0\text{kph}$, $se = 2.94$), and kinesiotape ($m = 122.2\text{kph}$, $se = 2.23$) means.

Table 1. A Repeated Measures ANOVA Examining The Acute Effect of Kinesiotape on Throwing Velocity

Taping Condition	Mean (kph)	Std. Error	95% Confidence Lower Bound	Interval Upper Bound
No Tape	120.8	2.1	116.3	125.4
Placebo Tape	123.0	2.9	116.7	129.3
Kinesio-tape	122.2	2.2	117.4	126.9

Additional Findings

An examination of the effect of playing position and tape condition on throwing velocity was also conducted. The positions were broken up into 2 categories: pitchers (position 1) and fielders (position 2). A repeated measures ANOVA was used to compare the velocities for the subjects under each condition. Table 2 illustrates the mean velocities for each condition. A 2 X 3 mixed design ANOVA was calculated to examine the effects of position

(Positions 1 and 2) and taping condition (no tape, placebo tape (Elastikon), and kinesiotape) on throwing velocity. No significant main effects or interactions were found. The tape x position interaction ($F(2,28) = .97, p >.05$), the main effect for taping condition ($F(2,28) = .64, P >.05$), and the main effect for position ($F(1,14) = .48, p > .05$) were all not significant. Throwing velocity was not influenced by either taping condition or position at the $p = .05$.

Table 2. A Mixed-Design ANOVA Examining The Acute Effect of Kinesiotape on Throwing Velocity by Position

Position	Taping Condition	Mean (kph)	95% Confidence Interval		
			Std. Error	Lower Bound	Upper Bound
1*	NT*	121.7	3.8	113.5	130.0
	PT*	126.0	5.3	114.6	137.4
	KT*	122.8	4.0	114.2	131.4
2*	NT*	119.9	1.8	116.0	123.9
	PT*	119.9	2.5	114.4	125.4
	KT*	121.5	1.9	117.4	125.7

*1 (Pitchers), *2 (Fielders), NT* (No Tape), PT* (Placebo Tape), KT* (Kinesiotape)

DISCUSSION

Discussion of Results

The primary purpose of this study was to examine the effect of kinesiotape on throwing velocity as it relates to athletic performance on three levels. The three variables were a control with no tape, a placebo tape, and kinesiotape. Each volunteer subject completed a dynamic warm up protocol at each session prior to testing. Each subject completed five trials under each condition; and the greatest velocity measured under each variable was deemed optimal throwing velocity for that condition. When examining the effects of kinesiotape on throwing velocity, no significant differences were observed within subjects under three different taping conditions. This is supported by studies that concurrently examined kinesiotape and its effect on muscular output and velocity.

A study by Fu, Wong, Pei, et al²¹ assessed kinesiotape in a similar measure by examining muscular strength. The researchers also perceived the subjects under three different taping conditions: no tape, immediately after taping, and twelve hours after taping. They found that

there were no significant differences observed in muscle power among the three conditions by evaluation of concentric quadriceps contractions at 60°/s; eccentric quadriceps contractions at 60°/s; concentric quadriceps contractions at 180°/s and eccentric quadriceps contractions at 180°/s; with testing protocol repeated to test the hamstrings muscle strength. The study inspected a similar measure of muscular production, and found no notable changes within the subjects due to the taping condition. A concurrent study by

Vithoulka et al,²³ assessed kinesiotape efficacy on quadriceps strength at maximum concentric and eccentric isokinetic exercise mode in healthy, non-athlete woman. The researcher tested subjects analogous to the protocol used in this thesis. Under three different taping conditions: no tape, placebo tape, and kinesiotape; there was found to be no significant differences in max concentric torque within subjects.

A similar study examining kinesiotape's effect on muscle contractility was conducted under a similar three-condition design. No tape, Elastikon tape, and kinesiotape we used to scrutinize grip strength in male subjects. The researchers also found no significant in strength between the control and kinesiotape groups.²⁷

The results of these studies are important to consider for athletic trainers' in future use of the kinesiotape on our patients or athletes because there is not substantial evidence-based research to propagate an established practice of kinesiotape and its techniques.

The goal of this study was to examine the effects of kinesiotape on throwing velocity. Through successful testing and statistical analysis, no significant difference was noted between the three taping conditions. This new knowledge is meaningful because evidence-based research is lacking in the dynamic field of kinesiotape. However, more and more studies are being conducted which examine the various proposed uses this tape claim to be effective for. It would be advantageous for future research to examine not only the effect of kinesiotape on muscular strength as demonstrated in this thesis, but also for the other qualities which the tape advertises such as edema reduction, proprioception, joint stability, and lymphodemic potentials. Forthcoming studies should also adhere to a randomized, double-blind, controlled study; to maintain the highest level of quality and the most accurate results for the prospective of this tape.

Conclusions

In conclusion, there is little evidence to support that the use of kinesiotape increases throwing velocity. The findings indicate that there are no significant differences in throwing velocity between any of the three taping conditions, as well as no significant differences in throwing velocity for the taping conditions by position. The kinesiotape conditions threw slower than the placebo tape condition, but faster than the no tape condition. The no tape circumstance, overall, threw slower than both the placebo tape and kinesiotape. Performance tests within subjects on a larger scale in future studies could provide more evidence in this area of interest.

Impacts on clinical practice would be significant if future research continues to examine all of the stated claims for kinesiotape. If studies are able to relate an evidence-base supporting the use of kinesiotape within rehabilitation practice, more clinicians, and patients, would benefit greatly from its efficacy. As it relates to throwing velocity, athletic trainers' and other professionals would find this information useful. This study alone cannot support or deny claims of increased

muscular output. However, future studies have the ability to solidify this tapes effectiveness.

Recommendations

Current literature is still in its infancy as it relates to kinesiotape. There are very little studies that examine kinesiotape within an athletic realm. Some studies inspect how kinesiotape would affect specific muscles during a unilateral activity under low to moderate intensity. However, in athletics there are multiple muscles working at high rate of movement. This is an opportunity for future studies to examine the multiplanar movements and how kinesiotape may affect athletes or physically active people under these specific conditions.

If another study was conducted, a double-blind study type with more subjects would be preferred. It would also be advantageous to observe kinesiotapes effects within a softball populace due to the difference in throwing mechanics. A future study could also examine this study with a different taping procedure applied. Activating different muscle groups compared to this study could yield different results.

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APPENDICES

APPENDIX A
Review of Literature

REVIEW OF LITERATURE

Kinesiotape has been the subject of a lot controversy within the medical field in recent years. Its popularity has increased with the explosion of its prevalence of usage within the sports medicine and physical therapy fields. The proposed study will examine how kinesiotape will affect the velocity of a throw or overhead movement in athletes involved in such sports. Though research examining the effectiveness of kinesiotape is in its infancy in terms of publication, there still is a need to observe whether this new technology is clinically useful in the athletic training realm.

The purpose of this review is to examine published literature evaluating the relationship between kinesiotape and throwing velocity. The information obtained within this study can aid clinicians in their practical decision making; in regards to using this tool within their practice. This will be accomplished using the following sections: kinesiotape basics, defining muscular strength, biomechanics of the throwing motion, effects of kinesiotape on muscular strength, and effects of kinesiotape on

proprioception, endurance, and swelling or lymphatic drainage.

Kinesiotape Basics

The researcher in this article examined the original research of Dr. Kenzo Kase, known as the original pioneer of kinesiotape. The investigator detailed the various techniques outlined and also explained, in detail, the purposes for applying this type of tape. She also theorized the potential uses of this modality within the field of podiatry.¹

In a study by Kahanoc, a more in depth examination was performed examining the use of kinesiotape with athletes. The researcher concluded that kinesiotape is considered a safe technique with limited associated side effects to athletes. However, using this technique takes significant practice and certification with kinesiotape in order to be performed for optimal outcome for patients.²

In a concurrent systematic review by Kahanov, the study examined the use of kinesiotape within the athletic realm. The researcher detailed the proposed effects that this method can have upon athletes who are competing at multiple levels and its effectiveness within a

rehabilitation program. The examiner concludes that kinesiotape can be very effective in athletes and sports medicine although further research is warranted.³

Effects on Muscular Strength on Velocity

The examination of muscular strength in relation to kinesiotape intervention has begun to increase in frequency in peer reviewed journals. With this rise in popularity and evidence based effects of the tape, researchers should now begin to focus their energies to determining if kinesiotape is as effective in terms of velocity as it is with others. Using specific techniques, the utilization of this method could potentially have a great effect on a vast population.

A systematic review was performed, using a critique of all randomized controlled trials within the EBSCO Database, where kinesiotape and its effects were put under scrutiny. Out of the three published studies that met the inclusion criteria, two of them exhibited a high methodological quality status with the other one receiving a score of "limited" using the 11-item PEDro scale. According to the research none of the literature showed clinical significance ($p < 0.05$) in relation to the use of kinesiotaping.⁴

In an article by Firth, Davies, Lewis, and Alexander⁶, the researcher examined kinesiotaping's effect on hop distance, pain, and motoneural excitability in both a healthy population and a population with achilles tendinopathy. Twenty-six healthy and twenty-nine subjects with achilles tendinopathy were used for this within-subject study. Results found no changes in hop distance when tape was applied and no changes in reported pain. The Hoffman (H) reflex amplitude of the lateral soleus and middle gastrocnemius increased in healthy people after the tape was removed, as collected using electromyographical activity measurements by utilization of surface electrodes. There was no change in activity in subjects with Achilles tendinopathy.⁵

In another report⁶, the authors detailed the initial effects of kinesiotape on strength, joint position sense and balance in patients with patellofemoral pain syndrome. Using a randomized double-blind study methodology, twenty-two subjects were separated into two groups: kinesiotape, and placebo kinesiotape. Forty-five minutes after application, positive significant differences were noted in muscle strength, joint position sense, static and dynamic balance, and pain intensity showing statistical increase in the kinesiotape groups.⁶

An additional report⁷ attempted to determine the effectiveness of kinesiotape in relation to muscle activity and vertical jump height performance. This study utilized thirty-one healthy adults which were divided into four groups: two elastic tapes, kinesiotape, and an MPlacebo (3M Micropore) tape. Results showed kinesiotape increased ground reaction forces, and EMG activity in the medial gastrocnemius. Height of jump, however, remained constant for all the groups¹⁸. This shows positive results in favor of kinesiotapes effect on muscular strength.

Fu, Wong, Pei, et al⁸ examined the effects of kinesiotape on muscular strength in athletes. This pilot study divided subjects into three conditions: no taping, immediately after taping, and twelve hours after taping. Results showed no significant difference in muscle power among the three conditions by evaluation of concentric quadriceps contractions at 60°/s; eccentric quadriceps contractions at 60°/s; concentric quadriceps contractions at 180°/s and eccentric quadriceps contractions at 180°/s; with testing protocol repeated to test the hamstrings muscle strength.

Additionally researchers⁹ examined the effect of kinesiotape on head-neck rotation and flexor muscle group dominant hand grip strength. Forty subjects (20 men,

20 women) were tested and the results found that grip strength increased in the dominant hand after application of kinesiotape when compared to that of the no tape condition.

In a study by Vithoulka et al, the effect of kinesiotape on quadriceps strength at maximum concentric and eccentric isokinetic exercise mode in healthy non-athlete woman, using three different taping groups: no tape, placebo tape, kinesiotape; results showed that there were no significant differences in max concentric torque between the three groups, but there was a significant difference in max eccentric torque during the concentric and eccentric modes of the quadriceps muscle group with the kinesiotape.¹⁰

Further research was conducted observing the kinesiotape in healthy colligate tennis athletes could decrease fatigue by maintaining strength in the forearm extensor group. Using fourteen Division I tennis athletes, results showed that grip strength was increased in the kinesiotape group as compared to the control group.¹¹

An additional report examined the influence of taping with a flexible tape (kinesiotape) on performance and its effect on the impulse in a stretch-shortening cycle movement. Twenty-three subjects were broken up into

kinesiotape and no tape groups. The results showed no significant difference in the jumping performance of the intervention group as compared to the control group.¹²

Yet another study was launched to view the effects of kinesiotaping on muscle contractility when compared to no tape and Elastikon taping applications on grip strength. Results showed significant differences between the Elastikon and kinesiotape groups in male subjects in that the Elastikon actually decreased performance. There was no reported significant difference in strength between the control and kinesiotape groups.¹³

The purpose of the following study was to investigate if kinesiotaping has an influence on the motor nerve conduction velocity. Seventeen healthy subjects were tested for this study. Results showed no significant differences between the kinesiotape and control groups with respect to latency, amplitude, and motor nerve conduction.¹⁴

Another study was conducted in order to test kinesiotape on bioelectrical activity of the vastus medialis muscle in the quadriceps muscle group. Twenty-seven healthy persons were tested and twenty-four hours after kinesiotaping revealed significantly increased recruitment of muscle's motor units (peak torque). After

seventy-two hours after taping there was significantly increased bioelectric activity.¹⁵

The researchers¹⁶ in this study examined how taping influenced electromyographic activity in the scapular rotators in healthy shoulders. The movement, direction, and tape were all randomized. Results showed no significant difference between the taping groups as it relates to scapular muscle activity.

Looking at the immediate effects of applied kinesiotaping to the forearm in maximal grip strength and force sense of healthy colligate athletes, twenty-one healthy athletes were used as subjects. Results showed no significant differences in maximal strength of grip between the three conditions: kinesiotape, placebo tape, no tape.¹⁷

In summary, the effect of kinesiotape on muscular strength is becoming more prevalent in current research. With the results showing the positive correlation between specific taping methods and other benefits of the tape, this aspect of the interventions potential must be explored. It would not only be clinically relevant, it would also open the doors to further research on possible other tapings or prophylactic methods for performance enhancement.

Effects on Proprioception, Endurance, Swelling

When examining effects of kinesiotape on proprioception, endurance, and swelling; the researchers of the following article studied the effect of fascia unload when kinesiotape was applied. The examiners performed a systematic review of kinesiotape and its effects on muscular events related to fascia injury. Through their research they found that this technique helps lower pain levels and increases range of motion, however there is inconclusive research related to its muscle power effect through fascia unloading.¹⁸

Additionally, examiners conducted research on kinesiotape and its effect on lower trunk ranges of motion. They studied thirty healthy individuals with no history of lower trunk or back issues and performed range of motion measurements pre-taping and post-taping. They concluded that trunk flexion was significantly improved as compared to the non tape group, with lateral flexion or extension showing now noteworthy improvement.¹⁹

More research was performed looking at the therapeutic effects of kinesiotape on Grade I lateral ankle sprains. Using twenty-five high school aged students who suffered grade I lateral ankle sprains. Using a control group who

used ASO tape, results found no significant difference between the two groups for pain or when performing single leg hop for distance, box drills or the Illinois test. Yet, the ASO group showed they could perform more squats than the kinesiotope group at four and eight weeks.²⁰

This study looked at the effects of different types of taping on functional performance in athletes with chronic inversion sprains of the ankle. Using a crossover study design method, fifteen athletes were used and split into kinesiotope; athletic tape, placebo, and no tape. There were no significant differences among the groups for SEBT. Kinesiotope and athletic tape yielded faster performance times in single limb hurdle as compared to the other groups. However, there was lower performance in the heel raise and vertical jump tests from the groups who had the tape.²¹

When examining shoulder pain, multiple techniques were used that including kinesiotope. The researcher also examined the clinical application and outcomes. Using supporting evidential research, she concluded that it could be a viable treatment adjunct.²²

In an additional study looking to determine and compare the efficacy of kinesiotope and physical therapy modalities in patients with shoulder impingement. Using a

DASH (Disability of the Arm, Shoulder, and Hand) as a subjective measurement, along with a visual analog scale, scores significantly decreased in both treatment groups as compared to baseline levels. The kinesiotape group scores significantly decreased with night, rest, and movement¹⁰. Supplementary research examined the effect of kinesiotape on calf injury prevention in triathletes during competition.²³

This pilot study observed the subjective perception of local pain after competition. It was observed that none of the athletes suffered contractures or cramps in the calves and pain was no more than a 2 on the CR10 scale in subjects with kinesiotape¹². Further examinations looked to determine how kinesiotape can be effective in the field of athletics and sports medicine. Using clinical observations, the researcher found that after kinesiotape application, injured athletes had decreased pain levels, as well as decreased visible edema, as well as no visible allergic reactions.²⁴

In a case report examining the use of kinesiotaping in the management of traumatic patella dislocations, the researcher found that the use of kinesiotape could be beneficial to decrease pain, and enhanced quadriceps

activity and weight bearing stability during functional activities.²⁵

Another study observed how kinesiotaping affected patients with patellar tendinopathy. Using a U-strip technique the researcher determined that the use of the tape could be beneficial due to the fact that the final position of the tape does not restrict range of motion.²⁶

In this additional article describing how kinesiotape can be used to aid in pain relief and also allow proper muscle activation in an athletic population, the researchers found that its biggest aid was in the ability of the tape to act as a constant treatment that the athlete can wear between treatments and still receiving an advantage.²⁷

Additional research examined the effect of elastic taping on kinematics, muscle activity, and strength of the scapular region in baseball players with shoulder impingement. Seventeen baseball players were tested. All subjects received kinesiotape and the placebo tape. Results showed that kinesiotaping significantly increase scapular posterior tilt at 30° and 60° during arm raising and increased the lower trapezius muscle activity in the arm lowering phase in comparison to the placebo tape.²⁸

Supplementary research examined the signs of subacromial impingement syndrome and the effect of taping these patients. Using a randomized controlled study methodology, One hundred and forty patients were assessed as subjects. The results indicated that taping patients with this condition improved outcomes on pain relief and functional improvement.²⁹

Throwing Velocity

There are multiple ways in which throwing velocity can be assessed. Freeston and Rooney³⁰ detailed a method which involved the incorporation of a radar gun measuring velocity as a percentage of the individual's maximal throwing velocity, rather than expressing the number of throws at a set distance or percentage of perceived maximal exertion.

Marques et al determined throwing velocity by the use of a Doppler radar gun which was located behind a target with intraclass correlation coefficient for throwing velocity at 0.95 (95% confidence interval: 0.91-0.96) and coefficient of variation of 3.5%.³¹

For the purposes of this study we will examine throwing velocity as detailed by Carter et al as detailed in the methods section.

In summary, current evidence based research relating to kinesiotape's wide range of use is lacking. While other aspects such as edema control, lymphatic drainage, and pain have become more relevant; studies involving muscular strength are still in their infancy. It is imperative that testing procedures are performed on any and all characteristics of this modality. The evidence based outcomes of a study such as this could help add another tool which practicing clinicians may be able to employ within an ever dynamic field.

APPENDIX B

The Problem

STATEMENT OF THE PROBLEM

The purpose of the study is to examine the effect of kinesiotape on throwing velocity. It is important to examine this intervention because kinesiotape has become very popular within the medical community but there is still little current research in regards to its effect on throwing velocity or muscular strength. We already are aware of the positive effects of this tape on lymphatic drainage, edema control, and myofascial symptoms; yet, if it is possible to definitively state whether kinesiotape will increase this variant of muscular strength, we can possibly relate it to other joints within the body and the specific demands of a therapeutic rehabilitation program. I also believe that this study could clarify exactly what the kinesiotape's role in relation to the human anatomy and the effects on any power production systems within the body.

Definition of Terms

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

- 1) Kinesiotape - a special type of tape manufactured with a special weave and viscosity that allows ventilation

and water resistance, with more expanded elasticity and a minimization of skin discomfort.¹⁸

- 2) Throwing Velocity- mainly contributed by internal rotation of the shoulder and elbow external rotation; in addition maximal pelvis, trunk rotation and flexion correlate positively with ball release velocity.³⁶

Basic Assumptions

The following are basic assumptions of this study:

- 1) The subjects will be honest when they complete their demographic sheets.
- 2) The subjects will perform to the best of their ability during testing sessions.
- 3) All taping procedures will be applied with a high degree of consistency.

Limitations of the Study

The following are possible limitations of the study:

- 1) The validity of kinesiotape and specific techniques to increase muscular performance has yet to be definitively determined.
- 2) The velocity of the throws from the subjects will differ based upon many variables.

Delimitations of the Study

The following are possible delimitations of the study:

- 1) The subjects will be California University of Pennsylvania Division II male and female varsity athletes.

Significance of the Study

The significance of this study will be multi-tiered. First, if any positive correlation can be made, the implications with the use of kinesiotape in athletics can be expanded to beyond baseball and softball. Secondly, within the rehabilitation realm, this intervention can be used to increase muscular strength or velocity in those involved in injury recovery.

APPENDIX C

Additional Methods

APPENDIX C1

IRB APPROVAL: CALIFORNIA UNIVERSITY OF PENNSYLVANIA

From : instreviewboard
Subject : IRB approval for proposal # 12-042

**Institutional Review Board
California University of Pennsylvania
Morgan Hall, Room 310
250 University Avenue
California, PA 15419
instreviewboard@calu.edu
Robert Skwarecki, Ph.D., CCC-SLP, Chair**

Dear Erin Podroskey and Ryan Davis:

Please consider this email as official notification that your proposal titled "The Acute Effects of Kinesiotape on Throwing Accuracy in Overhead Sport Athletes" & "The Acute Effects of Kinesiotape on Throwing Velocity" (Proposal #12-042) has been approved by the California University of Pennsylvania Institutional Review Board as submitted.

The effective date of the approval is 3-1-2013 and the expiration date is 2-28-2014. These dates must appear on the consent form.

Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:

- (1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)**
- (2) Any events that affect the safety or well-being of subjects**
- (3) Any modifications of your study or other responses that are necessitated by any events reported in (2).**
- (4) To continue your research beyond the approval expiration date of 2-28-2014 you must file additional information to be considered for continuing review. Please contact instreviewboard@calu.edu**

Please notify the Board when data collection is complete.

**Regards,
Robert Skwarecki, Ph.D., CCC-SLP
Chair, Institutional Review Board**

APPENDIX C2

Individual Data Collection Sheet

Subject Number _____

Gender _____

Position _____

Taping Condition _____

Training Session Number _____

Throwing Condition	Warm Up Complete	5 Warm Up Throws Complete	Throw 1	Throw 2	Throw 3	Throw 4	Throw 5
Accuracy (CM)							
Velocity (KPH)							

Comments:

Notes:

APPENDIX C3
Taping Protocol

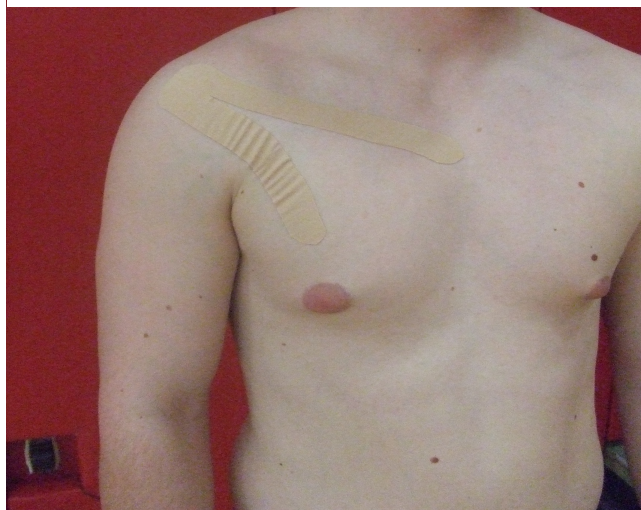


Figure 1. Pectoralis Major Inhibition Taping



Figure 2. Rhomboid Major Facilitation Taping

APPENDIX C4

Spec Sheet for Radar Gun

8. Specifications

Weight	(with batteries)	2 lbs .91 kg
	(without batteries)	1.33 lbs .60 kg
Height	10 in	
	24.40 cm	
Width	3.13 in	
	7.94 cm	
Length	7.13 in	
	18.10 cm	
Operating Temperatures	-4 F to +140 F	
	-15 C to +60 C	

8.1 Antenna Parameters**K-Band**

Nominal transmission frequency	24.150 GHz ± 50 MHz
Nominal horizontal beamwidth	12
Polarization	circular
Nominal microwave power output	10 mW
Maximum aperture power density	1 mW / cm ²

Environment

Ambient operating temperatures	-22 F to +158 F
	-30 C to +70 C
Maximum humidity	90% relative humidity at 98.6 F (37 C) (non-condensing)

Water resistance meets International Robustness Standard IEC 529:1989 and European Community Standard EN 60529 Classification IP55. These set international standards for immunity from damage by solid protrusions and water.

8.2 Voltages

Supply voltage	6.2 VDC - 8.0 VDC
Power supplied from replaceable Ni-Cad batteries	
Low voltage threshold	6.2 VDC

8.3 Speed Range Parameters

Range	25 - 125 mph
	40 - 200 kph
Display accuracy	± 1 display unit
Internal accuracy	± 0.4 display unit
Target acquisition time	0.021 seconds

8.4 Power Consumption Parameters

Power output	5 mW nominal
Power density	0.5 mW / cm ²

Figure 3. Radar Gun Specifications.

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ABSTRACT

TITLE: THE ACUTE EFFECTS OF KINESIOTAPE ON THROWING VELOCITY IN COLLEGIATE BASEBALL ATHLETES

RESEARCHER: Ryan F. Davis, ATC, PES

ADVISOR: Thomas F. West, PhD, ATC

PURPOSE: To determine the acute efficacy of kinesiotape on throwing velocity.

METHODS: Sixteen volunteer subjects were asked to make five successive throws under three different taping conditions; no tape, placebo tape (Elaskiton®), and kinesiotape (Kinesio® Tex Gold™). The velocity for each throw was measured by a radar gun and recorded. The highest speed, measured in kilometers per hour (kph), was deemed optimal throwing velocity under the specific condition.

FINDINGS: The primary purpose of this study was to examine the effect of kinesiotape on throwing velocity as it relates to athletic performance on three levels. The three variables were a control with no tape, a placebo tape, and kinesiotape. Sixteen male subjects volunteered to be a part of this study. Each informed subject completed a dynamic warm up protocol at each session prior to testing. Each subject completed five trials under each condition; and the greatest velocity measured under each variable was deemed optimal throwing velocity for that condition. There was no significant effect found ($F(2,28) = .64$, $p > .05$). No significant difference exists among no tape ($m = 120.88$, $se = 2.13$), placebo tape ($m = 123.01$, $se = 2.94$), and kinesiotape ($m = 122.21$, $se = 2.23$) means.

CONCLUSION: After reviewing the results of this study it is concluded that kinesiotape does not have a significant effect on throwing velocity. Testing specific claims of this tape still

remain in their infancy; however, this leads to a large opportunity for future evidence-based research to examine not only the muscular output assertions, but also the many other therapeutic goals this tape has been used for.