Keystone Journal of Undergraduate Research 7(1): 1-6, 2020.

The Effects of Kinesiology Tape on Shoulder Stability and Functional Performance

Christina M. Perry and Eric L. Lippincott

Health Science Department
Lock Haven University

ABSTRACT

The aim of this study was to observe and analyze the effects of kinesiology tape on shoulder stability and functional performance. Twenty, healthy, college-aged students (20.1 +/- 1.2 y; 168.0 +/- 10.1 cm; 4 male, 16 female) were recruited. A counterbalanced design was utilized. Shoulder stability was measured via postural sway using the NeuroCom® Balance Master with eyes open and eyes closed. Functional performance was measured with the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) with eyes open. Participants were randomly assigned order of start testing. A Paired Samples t-test was utilized to determine differences in shoulder stability and functional performance between tape application and no tape application, with an a-priori α-significance level of 0.05. No differences in mean sway velocities were noted between tape and no tape groups with eyes open ($p=0.807$; 0.356 deg/sec +/- 0.105 v. 0.360 deg/sec +/- 0.112, respectively) and eyes closed ($p=0.466$; 0.429 deg/sec +/- 0.145 v. 0.414 deg/sec +/- 0.132, respectively. No difference was noted in the CKCUEST between the tape and no tape groups ($p=0.482$; 0.274 +/- 0.111 v. 0.266 +/- 0.069, respectively). Kinesiology tape does not appear to have an impact on shoulder stability and functional performance in healthy, college-aged participants.

Keywords: Closed Kinetic Chain, Stability Test, Athletic Training; Physical Therapy

Kinesiology tape has become a popular technique to purportedly improve athletic performance and prevent and treat musculoskeletal injuries since its appearance in the 2008 Beijing Olympic Games. Dr. Kenzo Kase developed kinesiology tape in the 1970s with claims that its application can help to relieve pain, increase joint stability, increase strength, improve lymph and blood circulation, and improve joint position sense and kinesthetic awareness (Kase, 2003). Unlike traditional athletic tape, kinesiology tape can stretch up to 140% of its original length and provides a constant shear force to the skin, allowing an individual to wear the tape during physical activity (Kase, 2003). When applied to the skin, the tape is said to microscopically lift fascia and provide additional space subcutaneously to promote circulation and healing (Kase, 2003). The constant shear force of the tape on the skin is said to stimulate cutaneous mechanoreceptors and improve joint proprioception (Murray, 2000). Taping is most commonly used in sports by athletic trainers to help prevent sport injury as well as by other clinicians as a form of rehabilitation treatment and prevention of musculoskeletal injuries in a variety of clinical settings. The previous research is mixed on the effectiveness of kinesiology tape (Bailey and Firth, 2017; Burfeind and Chimera, 2015; Choi and Lee, 2018; Freitas et al., 2018; Keenan et al., 2017; Reneker et al., 2018).

Shoulder stability is provided dynamically by the periscapular musculature, and statically by the ligamentous, cartilaginous, and bony structures of the shoulder. Specifically, the rotator cuff, pectoralis, and deltoid muscles provide dynamic stability to the glenohumeral joint. Neighboring muscles, such as the serratus anterior, also provide the scapula with stable support to prevent uncontrolled winging movements. The glenohumeral ligaments and glenoid labrum are important static stabilizers of the glenohumeral joint, especially as the joint enters a position of abduction and

external rotation. Proprioception, the awareness of the position and movement of the body through space, also plays an important role in promoting shoulder stability via muscular activation in various joint positions.

Injury to the glenohumeral joint may result in decreased strength, ligamentous laxity, and/or decreased proprioception. Clinicians apply kinesiology tape to the shoulder to enhance the stability of the shoulder joint via increased muscular activation and/or increased proprioception. A case study research by Kim and Lee (2015) indicates that kinesiology tape may be effective in promoting stability of the scapula allowing humeral movements without pain.

Previous studies have shown the effectiveness of kinesiology tape in the reduction of shoulder pain in individuals with shoulder pain and impingement syndrome (Kaya et al., 2010; Simsek et al., 2013; Thelen et al., 2008; Garcia-Muro et al., 2010). However, no previous research has studied the impact of kinesiology tape on shoulder stability. The purpose of this study was to determine if kinesiology tape influenced shoulder stability in healthy adults.

METHODS

Participants

Twenty healthy individuals (20.1 +/- 1.2 y; 168.0 +/- 10.1 cm; 4 male, 16 female) were recruited from Lock Haven University to participate in this study. Institutional Review Board approval was obtained, and each participant provided consent prior to data collection.

Procedures

The study utilized a repeated measures design with counterbalancing within groups. The participants were then randomly assigned to one of two groups (Figure 1). All participants warmed up for 5 minutes on an upper-body ergometer prior to testing. The kinesiology tape (Mueller® Kinesiology Tape) was applied by a single researcher (CP) in order to promote consistency in tape application between participants. The taping method used was a neurological/structural method as described by the TheraBand company on their website (http://www.therabandktape.com/videos/applications.html).

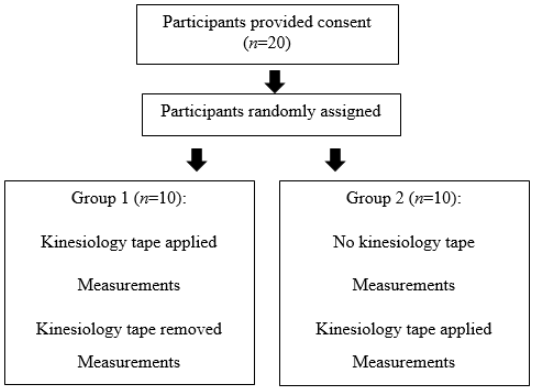

Figure 1: Study design.

Tape application

Two pieces of kinesiology tape were used per participant, the first piece being a Y-strip and the second being an I-strip. The length of the initial Y-strip was measured from the top of the acromion process and ended at the deltoid tuberosity. The formation of the Y-strip was made by cutting the tape down the middle leaving a 2-inch uncut piece at the end producing two tails. The end of that strip was applied to the skin with no stretch at the deltoid insertion to the tuberosity of the humerus. The tails were applied around the anterior and posterior borders of the deltoid. The strip outlining the anterior border of the deltoid was applied with the participants' upper extremity externally rotated and abducted to apply a stretch to the skin and outline the anterior border of the muscle. The strip outlining the posterior border of the deltoid was applied with the participants' upper extremity internally rotated and adducted. The second trip, the I-strip, was applied horizontally and inferior to the coracoid process. A light friction force was then applied to the outside of the tape to maximize effects and promote proper activation. The kinesiology tape was applied to both shoulders (Figure 2).

Figure 2: Kinesiology tape application

Shoulder functional performance was measured via the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) and shoulder stability was assessed via upper extremity postural sway which was assessed with the NeuroCom® Balance Master (Natus Medical Incorporated). The Closed Kinetic Chain Upper Extremity Stability Test is an evaluation of upper extremity performance in a closed kinetic chain position. This test is easy for clinicians to administer, can be easily understood by patients, and can be performed in any clinical setting. The results of the test provide quantitative data (score) based on the participant's performance (Tucci et al 2014). For the CKCUEST, all participants were asked to stabilize their bodies in a push-up position, maintain a neutral spine, and place their hands shoulder-width apart. Participants were then instructed to weight shift over one hand and lift their opposite hand to touch the weight bearing hand and return to the starting position. Participants were instructed to perform this task repeatedly (right to left; left to right) as fast as possible for 30 seconds (Figure 3). A timer was set for 30 seconds and time started when researcher (CP) stated "Go" and stopped when the timer sounded. The total number of touches was recorded for three trials and the data was normalized by dividing the mean number of touches by the participant's height. A two-minute rest break was given between trials to reduce the effects of immediate fatigue. During the Balance Master testing, participants were instructed to stabilize their bodies in push-up position with a neutral spine and their hands shoulder width apart on the force plate (Figure 4). The participants were instructed to maintain a stable position for 10 seconds. Three trials of the stability testing were performed with the participant's eyes open and three trials were performed with the participant's eyes closed. Mean sway velocity for three trials with the eyes open and the three trials with the eyes closed positions were recorded. The order of testing was randomized.

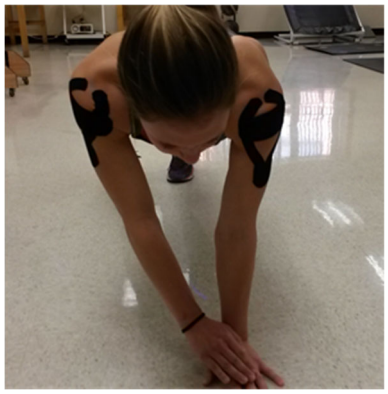

Figure 3: Closed Kinetic Chain Upper Extremity Stability Test

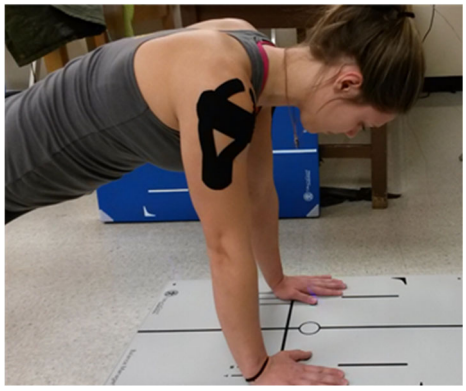

Figure 4: Balance Master testing

Data analysis

A paired sample t-test was used to determine differences in shoulder stability with and without the kinesiology tape applied. An a priori significance level was set at 0.05.

RESULTS

All 20 participants completed all portions of this study. Participant demographics can be found in Table 1. No significant difference was noted in any of the shoulder stability tests with the kinesiology tape applied versus no tape (Tables 2 and 3).

Table 1: Participant demographics

	Age (y)	Height (cm)
Female (n=16)	20.1 +/- 1.1	164.5 +/- 7.8
Male (n=4)	20.3 +/- 1.7	181.7 +/- 5.6
Total (n=20)	20.1 +/- 1.2	168.0 +/- 10.1

Table 2: Sway Velocity Results

					Paired Differences		
Condition	***n***	**Mean (deg/sec)**	**SD[1]**	**SEM[2]**	**t**	**df**	**Sig**
Eyes Open – No Tape	20	.360	.112	.025	-.745	19	.466
Eyes Open – Tape	20	.356	.105	.024			
Eyes Closed – No Tape	20	.414	.132	.029	-.745	19	.466
Eyes Closed – Tape	20	.429	.145	.033			

[1] Standard Deviation
[2] Standard Error of the Mean

Table 3: Closed Kinetic Chain Upper Extremity Stability Test Results

					Paired Differences		
Condition	***n***	**Mean[1]**	**SD[2]**	**SEM[3]**	**t**	**df**	**Sig**
No tape	20	.266	.069	.015	-.716	19	.482
Tape	20	.274	.111	.025			

[1] Normalized by participant height (total number of touches / participant height in (cm))
(One touch is defined as placement of one hand to the opposite hand while in plank position shown in figure 3)
[2] Standard Deviation
[3] Standard Error of the Mean

DISCUSSION

The purpose of this study was to determine if kinesiology tape influenced shoulder stability in healthy adults. Kinesiology tape is used clinically for a variety of patient conditions. Reported benefits include pain relief, improved circulation and lymphatic drainage, improved posture, and increased joint stability. The results of this study indicate that kinesiology tape application has no effect on shoulder stability and functional performance in healthy college-aged adults.

Kinesiology tape has been used as treatment in populations with hemiplegia post-stroke. A case report by Anandkumar and Manivasagam (2014) used kinesiology tape in their treatment approach of a 48-year-old woman with post-stroke complex regional pain syndrome. Due to the multimodal approach in the physical therapy management of this patient, the authors of this study were unable to determine any direct effects the kinesiology tape had on the patient even with the resolution of her symptoms. Another study by Kalichman et al. (2016) looked at the short-term effects of kinesiology tape on hemiplegic shoulder pain and motor ability in eleven patients post-stroke. Results from their study concluded that the application of kinesiology tape had no short-term effects on shoulder pain or range of motion in patients with post-stroke hemiplegia.

There are studies that have reported positive effects of kinesiology taping related to the shoulder. In a randomized, double blinded, placebo-controlled trial, Shakeri et al. (2013) found kinesiology tape to show significant changes in pain during movement and at night in participants with Shoulder Impingement Syndrome (SIS). In addition, Kaya et al. (2011) and Miller and Osmotherly (2009) studied the effects of kinesiology tape as a form of treatment in participants with SIS and found immediate results. Taping as treatment in Kaya et al. (2011) was compared to treatment of SIS with local modalities and concluded kinesiology tape to have a greater effect. Miller and Osmotherly (2009) used kinesiology tape for treatment of SIS in adjunct to routine physical therapy and found that the tape had a main effect during the early stage of treatment for SIS.

This study has several limitations. First, all testing procedures were performed by only one researcher (CP), and the researcher was not blinded to participant group allocation during testing. Although testing procedures and protocol were standardized across the study, the effects of observer bias were not completely eliminated. Second, all testing procedures per participant were completed on the same day within a 30-minute time frame thus not eliminating the potential for participant testing fatigue. Lastly, the sample size of this study was small, thus decreasing the generalizability of results.

Future research should include a larger number of participants, should blind the tester to the test condition, and should consider other methods for evaluating shoulder stability. This research study included participants who were healthy, young adults. Future research should include participants with a history of shoulder injury.

Conflicts of interest

The authors declare no conflicts of interest.

LITERATURE CITED

Bailey, D., and P. Firth. 2017. Does kinesiology taping of the ankles affect proprioceptive control in professional football (soccer) players? *Physical Therapy in Sport 25*: 94-98.

Burfeind, S.M., and N. Chimera. 2015. Randomized control trial investigating the effects of kinesiology tape on shoulder proprioception. *Journal of Sport Rehabilitation 24*(4): 405-412.

Choi, I., and J. Lee. 2018. Effect of kinesiology tape application direction on quadriceps strength. *Medicine 97*(22): 11038-11038.

Freitas, F.S., L.E. Brown, W.A. Gomes, D.G. Behm, and P.H. Marchetti. 2018. No effect of kinesiology tape on passive tension, strength, or quadriceps muscle activation during maximal voluntary isometric contractions in resistance trained men. The *International Journal of Sports Physical Therapy 13*(4): 661-667.

García-Muro, F., A.L. Rodríguez-Fernández, and A. Herrero-de -Lucas. 2010. Treatment of myofascial pain in the shoulder with kinesio taping. A case report. *Manual Therapy 15*:292-295.

Kalichman, L., S. Frenkel-Toledo, E. Vered, I. Sender, T. Galinka, D. Alperovitch-Najenson, et al. 2016. Effect of kinesio tape application on hemiplegic shoulder pain and motor ability: a pilot study. *International Journal of Rehabilitation Research 39*(3): 272-276.

Kase, K., J. Wallis, and T. Kase. 2003. *Clinical therapeutic applications of the kinesio taping method.* Tokyo, Japan: Ken Ikai Co. Ltd.

Kaya, E., M. Zinnuroglu, and I. Tugcu. 2011. Kinesio taping compared to physical therapy modalities for the treatment of shoulder impingement syndrome. *Clinical Rheumatology 30*:201–207.

Keenan, K.A., J.S. Akins, M. Varnell, J. Abt, M. Lovalekar, S. Lephart, and T.C. Sell. Kinesiology taping does not alter shoulder strength, shoulder proprioception, or scapular kinematics in healthy, physically active subjects and subjects with Subacromial Impingement Syndrome. *Physical Therapy in Sport* 24: 60-66.

Kim, B., and J. Lee. 2015. Effects of scapula-upward taping using kinesiology tape in a patient with shoulder pain caused by scapular downward rotation. *Journal of Physical Therapy Science 27*(2): 547-548.

Kinesio taping method. Kinesio Taping Association International Web site. http://www.kinesiotaping.com/about/kinesio-taping- method. Accessed June 29, 2016.

Miller, P. and P. Osmotherly. 2009. Does scapula taping facilitate recovery for shoulder impingement symptoms? A pilot randomized controlled trial. *Journal of Manual and Manipulative Therapy 17*(1): E6-E13.

Murray H.M. Kinesiotaping, muscle strength and ROM after ACL repair. Journal of Orthopedic *Sports Physical Therapy 30*(1): A-14.

Reneker, J.C., L. Latham, R. McGlawn, and M.R. Reneker. 2018. Effectiveness of kinesiology tape on sports performance abilities in athletes: a systematic review. *Physical Therapy in Sport 31:* 83-98.

Shakeri, H., R. Keshavarz, A.M. Arab, and I. Ebrahimi. 2013. Clinical effectiveness of kinesiology taping on pain and pain-free shoulder range of motion in patients with shoulder impingement syndrome: a randomized, double blinded, placebo-controlled trial. *International Journal of Sports Physical Therapy 8*(6): 800-810.

Şimşek, H.H., S. Balki, S.S. Keklik, H. Öztürk, and H. Elden. 2013. Does kinesio taping in addition to exercise therapy improve the outcomes in subacromial impinge- ment syndrome? A randomized, double-blind, controlled clinical trial. *Acta Orthopaedica et Traumatologica Turcica 47*:104–110.

Thelen, M.D., Dauber, J.A., Stoneman, P.D. 2008. The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. *Journal of Orthopedic Sports Physical Therapy 38*(7): 389–395.

Tucci, H.T., J. Martins, G.C. Sposito, P.F. Camarini, A.S. Oliveira. 2014. Closed kinetic chain upper extremity stability test (CKCUES test): a reliability study in persons with and without shoulder impingement syndrome. *BMC Musculoskeletal Disorders 15*(1)