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ORIGINAL RESEARCH REPORT

Randomized Control Trial Investigating the Effects of Kinesiology Tape on Shoulder Proprioception

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Context: Athletes participating in upper-extremity-dominant sports such as softball and volleyball are at increased risk for glenohumeral-joint pain and injury. For these athletes, an integral part of many injury-prevention and -rehabilitation programs includes improving joint proprioception. One way to measure joint proprioception is through the reproduction of joint angles, or joint-reposition sense (JRS). Kinesiology tape is purported to enhance neuromuscular feedback; therefore, it may influence JRS. However, conflicting findings and the lack of research in the upper extremity warrant further investigation. ***Objective:*** To determine the effects of kinesiology tape on shoulder-joint proprioception by actively reproducing joint angles, or measurement of JRS. ***Design:*** Randomized controlled trial. ***Setting:*** College laboratory. ***Participants:*** 9 men and 7 women 24 ± 3 y old. ***Intervention:*** SpiderTech kinesiology tape precut Shoulder Spider was applied to the shoulder of participants block randomized to the experimental group, following product-specific instructions, to measure its influence on JRS compared with a control group. ***Main Outcome Measurement:*** JRS-error scores in shoulder flexion, extension, internal rotation, and external rotation (ER). ***Results:*** There was a significant interaction between groups pre- to postintervention resulting in decreased JRS errors in flexion (P = .04) and ER (P = .03) in the experimental compared with the control group. The 95% confidence intervals suggest a clinically relevant difference in the variability of JRS errors between postintervention movements for the experimental group in flexion and ER, such that the control group demonstrated much more variability in JRS errors than the experimental group. ***Conclusions:*** After the application of kinesiology tape the JRS errors were smaller in flexion and ER. This may be of clinical significance in improving proprioception and thus improving joint stability. Additional research should determine the effectiveness of kinesiology tape in reducing joint injury.

Keywords: K-tape, joint-reposition sense, SpiderTech, upper extremity, joint-position sense, rehabilitation, position awareness

Historically, athletes that participate in upper-extremity sports are more prone to injuries to the glenohumeral joint. Acute and chronic glenohumeral-joint injuries may cause a decrease in stability and proprioceptive function at the joint.[1] Proprioception is a multiple-input sensation whereby afferent information from mechanoreceptors in the skin, muscles, ligaments, and tendons is integrated with the visual and vestibular inputs in the central nervous system to build a perception of position sense, movement sense, and force detection.[1] Proprioception is extremely important for upper-extremity joint coordination due to the complexity of the kinetic chain and the need for precision in tasks being performed.[2] Upper-extremity function depends on the ability to place the shoulder in an optimal position for functionality.[3] Furthermore, proprioceptive deficits have been identified in pathological and fatigued shoulders.[3] Therefore, an integral part of many rehabilitation programs is the attempt to improve proprioception to provide improved joint-position sense.[3] The only 2 methods of testing proprioception objectively are joint-reposition sense (position awareness) and force-detection testing. Both of these tests can provide an objective means of measuring the functionality of the mechanoreceptors that affect proprioception.[3] Clinically there is an interest in how to affect these specific mechanoreceptors to provide a means for injured athletes to recover more quickly while preventing reinjury and to prophylactically prevent injuries for those with poor proprioceptive-feedback mechanisms.

Stimulating proprioceptive cutaneous input by means of taping is effective in improving reaction speed and position awareness.[4] Tape is applied in such a way that there is little or no tension while the joint is held in the desired position.[5] The tape will, therefore, develop tension when movement occurs outside the set position. This tension will be sensed cutaneously, thus providing an afferent stimulus to the patient to correct the movement

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pattern.[5] Over time and with enough repetition and feedback, these patterns can become learned motor-cortex patterns for given movements.[5] Because of the ability to create tension due to its natural elasticity, kinesiology tape might be able to provide these stimulations to the proprioceptive cutaneous inputs, thereby improving position awareness.

Kinesiology tape was developed approximately 40 years ago and has gained popularity after it was showcased in the 2004 summer Olympics by Kerri Walsh, who used it to assist her shoulder after surgery on her rotator cuff.[6] Kinesiology-tape manufacturers claim that their products have the ability to relax muscles, facilitate neuromuscular rehabilitation in weak muscles, reduce pain, and reduce swelling by improving circulation. The properties of kinesiology tape give the practitioner the ability to limit range of motion (ROM) or assist with movements at a specific joint.[7] The elasticity of kinesiology tape ranges from 130% to 140% such that it is able to stretch to 30% to 40% of its original length.[7] It was also created to replicate the thickness of skin so that users wouldn't perceive that they were actually wearing tape.[7] Furthermore, kinesiology tape is made from 100% cotton to wick sweat and it is 100% latex free. In addition, because it is activated by heat it leaves no adhesive residue behind.[7] The tape is manufactured in such a way that it mimics a fingerprint, with its wave patterns allowing for the tape to lift the skin, which in turn is proposed to promote increased blood flow and moisture wicking.[7] With these manufactured attributes, kinesiology tape appears to provide the means to affect position awareness, but limited research has been done.

Research involving kinesiology tape has demonstrated that its application to the ankle does not appear to have an effect on proprioception at the ankle.[8] However, it has been demonstrated through a questionnaire and perception of passive ROM in plantar flexion that the strips of athletic tape do provide an increased sense of proprioception compared with the untaped ankle.[9] An additional study on the effects of tape on the ankle found that nonelastic sports tape may enhance dynamic muscle support of the ankle.[10] In a more recent study, results suggest that tactile stimulation in the form of kinesiology tape inhibits the decline of both strength and electromyography and indirectly suggest that stimulation of skin around the knee could counter rectus femoris weakness due to attenuated IA afferent activity.[11] Finally, the most recent study cited here on kinesiology tape found that after kinesiology tape was worn for an extended amount of time, proprioceptive deficits were improved.[12] After tape application, the improvements resulted in similar proprioceptive awareness in subjects with and without ankle instability.[12] Although kinesiology tape is used extensively in the medical field by health care professionals, there is still a lack of supportive research showing that kinesiology tape actually provides all the benefits that it claims, and to date no study has investigated its effects on proprioception in the upper extremity Therefore, the purpose of this study was to determine the effects of kinesiology tape on shoulder-joint proprioception by actively reproducing joint angles, or measurement of joint-reposition sense. The hypothesis was that kinesiology tape would reduce shoulder-joint reposition-sense errors in flexion, extension, external rotation, and internal rotation from preintervention to postintervention compared with control condition. The second hypothesis was that there would be less variability in joint-reposition-sense errors in flexion, extension, external rotation, and internal rotation after the application of kinesiology tape.

Methods

Research Design

The design of this study was a pretest–posttest randomized control. The independent variables were time (pre and post) and tape condition (taped and nontaped). The dependent variable was joint-reposition-sense error (degrees) and variability in joint-reposition-sense errors.

Participants

Sixteen (9 male and 7 female, age 18–30 y) healthy individuals volunteered for study participation. Exclusion criteria included a history of any previous shoulder injury or surgery in the past year, any current shoulder pathologies (sprain, strain, bursitis, or fracture), loss of sensation in the shoulder, or any allergy to adhesives. This study was approved by the Daemen College Human Subjects Research Review Committee, and an informed-consent form was signed by all participants before any data collection.

Instrumentation

Range of Motion. A Baseline bubble inclinometer (model 12-1056, Fabrication Enterprises, White Plains, NY) was used to measure ROM in the shoulder. The inclinometer resembles a flat goniometer with 360° (marked in single-degree increments on the circumference). The angle is determined by comparing the location of the needle on the inside of the inclinometer with the degree markings around the circumference. A single investigator (S.B.) measured all goniometry, so intratester reliability should be similar to reliability previously documented. The previous literature documents that reliability for measuring internal and external shoulder-joint-reposition sense is .99 for intratester and .99 for intertester.[13]

Kinesiology Tape. SpiderTech kinesiology tape (precut Shoulder Spider, SpiderTech Inc, Ontario, Canada) was used for the intervention in this study. The kinesiology tape was applied to the shoulders of the experimental group using the techniques described on the manufacturer's Web site.[14] An instructional video from the manufacturer's Web site was also reviewed to provide a more comprehensive understanding of how

to apply the tape.[14] The tape was applied by a single investigator (S.B.).

Procedures

Before consenting, the testing group and testing shoulder were randomly assigned for each potential participant. All agreeing participants signed the informed-consent form. A copy of this form was supplied to the participant. A health-history questionnaire was administered to screen for study-participation appropriateness.

The methods for this study were adapted from a previous study by Dover et al.[15] All testing was performed in a single clinical laboratory classroom at Daemen College. Before beginning, the shoulder to be tested was block randomized by alternating between right and left for each participant as he or she volunteered for participation. In addition, the testing group was also block randomized by alternating between control and experimental groups for each participant as he or she volunteered for participation. Block randomization allowed us to obtain equal data values for right and left shoulders, as well as control-group participants and experimental-group participants. To determine which group of motions (flexion/extension or internal/external rotation) the first participant started with, a flip of the coin was used. For example, if the participant flipped a heads the flexion/extension motion group was tested first and the internal/external rotation motion group was tested second. Testing order (ie, flexion before extension or extension before flexion) was also randomized with the flip of a coin.

For both control and experimental groups, the inclinometer was secured to the lateral side of the participant's wrist using a Velcro strap (Figure 1). During the active-ROM joint positioning, the participant was instructed to make a fist with the testing hand to decrease any extraneous movement at the hand and wrist. Active-ROM measurements for internal and external rotations were measured with the participant in supine with the shoulder abducted to 90° and the elbow flexed to 90°. The patient was supine for internal and external rotation so that the scapula was stabilized by the table, thereby reducing scapular substitution to glenohumeral movement. In an effort to reduce tactile feedback, no other restraining devices were used to further stabilize the trunk or scapula. The flexion and extension movements were measured while the participant was standing. While in this position, the participant was instructed to maintain an upright posture and to avoid any extra arching of the back. If the participant moved the trunk during any ROM or joint-reposition measurements, the trial was repeated. No other restraints were used in these measurements.

The joint-reposition-sense testing first required a calculation of the target angle based on the active-ROM measurement. The target angle was calculated by subtracting 10% of the total ROM (external rotation + internal rotation or flexion + extension) from the maximum active ROM being tested. For example, if the total ROM for internal and external ROM was 90° and the motion being tested was internal rotation, which had a maximum ROM of 40°, then 9° (10% of 90° [total range for internal and external ROM]) was subtracted from 40° to yield a target angle for joint-reposition testing of 31° for internal rotation. A percentage of the total ROM ensured that each participant experienced the same relative target angle. Target angles for all 4 movements were calculated before joint-reposition-sense testing began. Immediately after target-angle calculations, a blindfold was applied to the participant and the joint-reposition-sense testing began.

Figure 1 — Use of the bubble goniometer when measuring external- and internal-rotation ranges of motion with the participant in the supine position.

The participant's testing arm was passively moved to the target angle by the investigator. This target-angle position was held for 3 seconds. The participant was then told to relax and actively return the arm to the neutral starting position. During the external/internal-rotation movements, the neutral position was achieved when the forearm was perpendicular to the table (0° of shoulder rotation). During the flexion/extension movements, the arm was at neutral when relaxed at the participant's side. Participants were then instructed to actively return the arm to the target angle and inform the investigator when they felt they had reproduced the original target angle. The arm was then held motionless while the angle was read from the bubble inclinometer and recorded on the

data-collection sheet. The repositioning was repeated 2 more times for a total of 3 successful trials for each of the 4 movements.

At that point, the blindfold was removed. For those randomly allocated to be in the experimental group, kinesiology tape was then applied to the shoulder by a single investigator (S.B.). The precut Shoulder Spider from SpiderTech, Inc, was used for all experimental participants. The techniques were followed directly from the kinesiology tape manufacturer's Web site and were applied with the following instructions. With the participant's arm resting at the side, half of the backing of section 1 was peeled off and applied to the shoulder along the junction of the upper arm and shoulder at the middeltoid. Once half of section 1 was applied, the remaining portion of the backing was torn off and the tape was applied to the skin. Then a gentle rub over the top of the tape was given to activate the glue. Next, with the patient's arm placed behind the back, the backing of section 2 was slowly peeled off, and with a small amount of stretch, the tape was applied along the top of the shoulder blade. As the backing of section 3 was peeled off, the tape was applied to the back of the shoulder without any stretch. The arm was then moved from behind the back to across the front of the body, placing the participant's hand on the opposite shoulder. The backing of section 4 was then peeled off and the tape was applied with no tension in the direction of the back border of section 1. Next, with the participant's arm extended straight behind the body, the backing of section 5 was slowly peeled off and the tape was applied with no tension along the lateral portion of the biceps muscle. Then, with the arm still extended, the backing of section 6 was slowly peeled back and the tape was applied to the biceps muscle without any tension. Next, with the participant's arm extended forward and the elbow straight, around the height of the shoulder, the backing of section 7 was slowly peeled back and the tape was allowed to contact the skin along the triceps muscle. With the arm pointing out in front and the elbow bent, around the height of the shoulder, the backing of section 8 was slowly peeled back and applied to the triceps muscle without any tension. Finally, a gentle rub over the top of the tape was given to activate the glue. Final application of the precut spider can be seen in Figure 2.

The participants randomly allocated to the control group sat quietly without movement for 5 minutes to account for the time needed for the participants in the experimental group to have the kinesiology tape applied. This step ensured that both control and experimental groups had an equivalent amount of time between testing periods. After the intervention, all participants immediately repeated the procedures for joint-reposition-sense testing while wearing the blindfold. The target angles calculated for the preintervention joint-reposition-sense testing were used in postintervention testing. Joint-reposition-sense error scores from the 3 repositioning trials of each position were calculated as the difference in degrees between the angle recorded during the active joint-reposition trial and the target angle. The absolute value of joint-reposition-sense error score from the 3 trials was averaged for statistical analysis.

Figure 2 — Final application of the SpiderTech Shoulder Spider used on the experimental-group participants.

Statistical Analyses

Deidentified data were analyzed using SPSS Statistics 20 (IBM Corp, Armonk, NY). Preintervention joint-reposition-sense data were evaluated for normalcy using histograms to evaluate skewness and kurtosis; equal variances were evaluated using the Levene test. Independent *t* tests were used to assess difference between groups in mean age. To determine statistical differences between groups preintervention and postintervention, a 2 × 2 (time-by-group) repeated-measures ANOVA was used with an alpha level of $P < .05$. In the case of nonnormally distributed or unequal variances in preintervention joint-reposition-sense data, a Mann Whitney U was used to assess differences between groups across time. The 95% confidence intervals were calculated for the experimental and control groups for each shoulder motion during the postexperimental condition. A post hoc power analysis was performed in SPSS to determine level of power for non–statistically significant findings.

Results

Sixteen participants (9 male, 7 female) between the ages of 18 and 30 volunteered for this study. There were no differences in age between the experimental (3 women, 5 men) and control (4 women, 4 men) groups (24.3 ± 3.9 vs 23.3 ± 1.3 y, $P = .50$).

Analysis of histograms for evaluation of skewness and kurtosis revealed that preintervention joint-reposition-sense errors were normally distributed and the Levene test was not significant for flexion ($P = .63$) and extension ($P = .34$). However, both external ($P = .007$) and internal ($P = .005$) rotation were skewed and had a significant Levene test during the preintervention measurement of joint-reposition-sense error. Repeated-measures ANOVA indicated that there were no main effects for time in joint-reposition-sense error in extension or flexion movements. There was a significant ($P = .03$) group-by-time interaction in joint-reposition-sense error in flexion such that joint-reposition-sense errors were significantly reduced postintervention in the experimental group while the control group had an increase in errors; extension was not significant (Table 1). Mann Whitney U revealed a significant difference ($P = .04$) in mean ranks in external-rotation joint-reposition-sense error between the experimental and control groups in the postintervention; there was no difference in internal-rotation joint-reposition-sense error between groups preintervention or postintervention (Table 2). Statistically significant findings indicated that we were adequately powered for group-by-time interactions for external-rotation and flexion measurements. A post hoc power analysis indicated that we were adequately powered to find a statistically significant group-by-time interaction in internal rotation ($\beta = .20$); however, we

Table 1 Repeated-Measures ANOVA Including Means and Standard Deviations for Joint-Reposition-Sense Errors (°) Between Control and Experimental (Exp) Groups Preintervention (Pre) to Postintervention (Post)

	Group	Time	Mean	SD	Group × time interaction *F, P*
Flex					6.03, .03*
	Control	Pre	4.44	2.12	
		Post	6.80	4.36	
	Exp	Pre	5.10	2.44	
		Post	3.24	2.41	
Ext					1.34, .27
	Control	Pre	4.68	2.34	
		Post	4.95	2.56	
	Exp	Pre	4.91	1.89	
		Post	3.27	2.80	

Note: Flex indicates flexion; Ext, extension.

*Significant at <.05.

Table 2 Mann Whitney U Including Means and Standard Deviations for Joint-Reposition-Sense Errors (°) for Control and Experimental (Exp) Groups Preintervention (Pre) to Postintervention (Post)

	Group	Time	Mean	SD	Pre U, *P*	Post U, *P*
ER					30.0, .83	12.0, .04*
	Control	Pre	6.86	4.48		
		Post	7.73	4.14		
	Exp	Pre	5.81	1.72		
		Post	3.40	2.72		
IR					19.0, .17	21.0, .25
	Control	Pre	2.86	1.41		
		Post	4.17	1.83		
	Exp	Pre	5.55	4.26		
		Post	3.06	1.94		

Note: U indicates Mann Whitney U for group ranks by time; ER, external rotation IR, internal rotation.

*Significant at <.05.

were underpowered in extension (β = .80). In addition, the 95% confidence intervals suggest a clinically relevant decrease in the variability of joint-reposition-sense errors in flexion and external rotation, but not in extension or internal rotation, when applying kinesiology tape to a healthy participant (Figure 3).

Discussion

The purpose of this study was to determine the effect of kinesiology tape on shoulder-joint-reposition sense compared with a control group. The findings indicate that kinesiology tape does have a statistically significant effect in reducing joint-reposition-sense errors in flexion and external-rotation ROM.

Our first hypothesis for shoulder-joint-reposition-sense errors in flexion, extension, external rotation, and internal rotation from preintervention to postintervention compared with control was supported in joint motions of flexion and external rotation, but not in extension or internal ROM. As upper-extremity athletes transfer energy from their trunk to their dominant arm during athletic performance, they inherently require greater flexion and external-rotation ROM to achieve velocities required for their respective sports.[15] These results might suggest that there is a relationship between the effectiveness of kinesiology tape on proprioception and ROM; the larger the joint motion, the more assistance kinesiology tape might provide to improve joint-reposition sense. Detection of passive movement in athletes participating in upper-extremity sports suggests that proprioception and joint-position sense were significantly improved at angles near the end ROM.[16] Furthermore, when reproducing target angles near end ROM, participants were more accurate and consistent than in other positions.[17] It is possible that the afferent signals and proprioceptive feedback from the surrounding muscles, ligaments, and capsule increase when they are stretched as the joint moves closer to end ROM. However, to gain a better understanding of this relationship, future research should consider assessing proprioceptive differences when moving from flexion to extension or external rotation to internal rotation due to differences in motion ranges.

Many outside factors affect the proprioceptive abilities of an individual. Previous literature has evaluated the differences in gender, extremity dominance, and fatigue on proprioceptive differences. Schmidt et al[18] compared joint-position sense in the shoulder between different ages, genders, and arms; they did not find any gender-specific differences in arm-position sense, opposing the widely shared notion that males had better spatial skills than females.[19] In addition, age did not affect proprioception; however, that study resulted in more-accurate joint-position sense in left-extremity (nondominant) proprioception for right-hand-dominant participants.[18] Those authors believed that this was due to a superior hemispheric capacity of the healthy right hemisphere in this proprioceptive-spatial task. However, another study failed to find a significant difference in proprioception between dominant and nondominant arms.[15] Voight et al[20] studied not only the effect of muscle fatigue on proprioception but also the relationship between arm dominance and proprioception, finding a relationship between muscle fatigue and decreased proprioceptive acuity. This suggests that fatigue affects the contractile elements of the shoulder, which include the muscle and the receptors within the muscle, and the onset of fatigue hinders one's ability to reproduce the

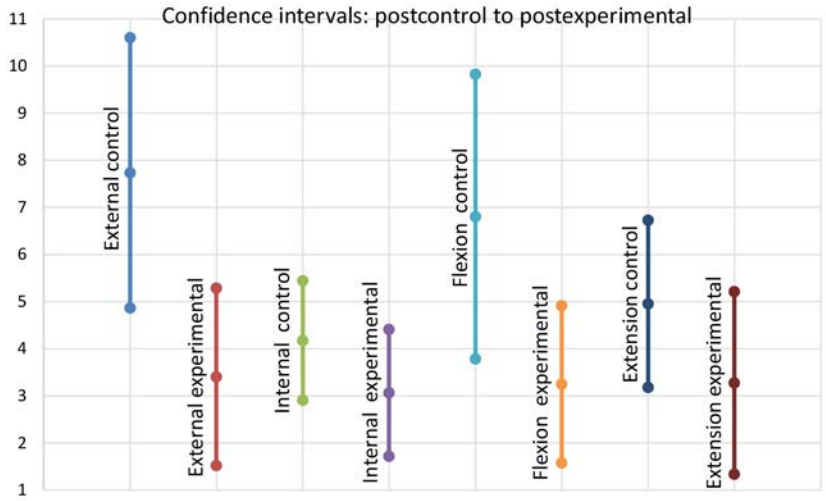

Figure 3 — Confidence intervals for postcontrol and postexperimental groups. This set of data is postintervention and shows the 95% confidence interval (the interval in which 95% of the population will fall when measuring degrees of error in the range of motion versus a target angle after testing joint-reposition sense) for the 4 motions tested.

targeted joint position.[20] Notably, kinesiology taping of the quadriceps muscle and patella after quadriceps fatigue significantly decreased repositioning errors of the knee joint, suggesting that the application of kinesiology tape may decrease fatigue-induced joint-repositioning error.[21]

The hypothesis that there would be less variability in joint-reposition-sense errors in flexion, extension, external rotation, and internal rotation after the application of kinesiology tape was partially supported in that the 95% confidence intervals demonstrated reduced variability in external rotation and flexion, but not extension or internal-rotation movements. Reducing errors in joint-reposition sense may play a critical role in permitting an athlete to return to play after a joint injury or as a means of injury prevention. Notably, our demonstration of less variability in external-rotation joint-reposition-sense errors in the kinesiology-tape group during the postintervention suggests that we may be able to enhance proprioception in a joint motion that is extremely sensitive to injury when placed in extremes of motion. If kinesiology tape can improve joint proprioception, this may be a means to improve joint stability and reduce injury. Our findings, in combination with previous work, suggest that kinesiology tape may moderate decreased joint-position awareness seen with factors such as injury, fatigue, and external influences. It is possible that taping improves a person's awareness of his or her joint position in space.[4]

This study was the first of its kind to look at the effects of kinesiology tape on proprioception in the shoulder. One important aspect considered in this study was that the shoulder girdle moves in all 3 planes; therefore, it is important to measure proprioception in as many planes and motions as possible. In previous studies assessing proprioception, measurements have been limited to 1 or 2 motions in 1 plane, most commonly internal rotation and external rotation.[16,22,23] It is believed that the addition of the flexion and extension motions provides more information about overall shoulder-joint proprioception.[16,22,23] Each movement stresses the capsule and glenohumeral muscles differently, which could affect afferent information and joint-position scores.[15] Data on only 2 movements may not provide enough information about the total joint-position sense of the shoulder, especially considering that the external-rotation joint-position-sense error scores have the most inconsistency.[15] In this study, like ones previously, flexion and extension measurements were performed with the athlete standing, which may be more conducive to the athlete's ability to sense joint position.[17] Athletes compete while standing; therefore, measuring joint ROM while standing reflects a more realistic environment in which to assess proprioception.

Previous and future researchers have and will continue to experience trouble when measuring joint-position sense because a number of peripheral variables may interfere with the precision of the measurement.[3] These extraneous variables can involve feedback that is not directly being measured but affects the afferent pathway of the shoulder mechanoreceptors. Normally, visual and auditory cues are eliminated when measuring joint-position sense by blindfolding the subject and playing music or white noise. While we did blindfold participants, a possible limitation in this study was that we did not play white noise for the participants. One challenge when trying to assess for true internal and external ROM is scapular movement, which if not restricted can influence rotational motions. Therefore, we decided to measure internal and external rotation in a supine position. It is possible that the increase in tactile feedback and the participants' awareness of body position while lying down could account for the subtle differences in the error scores between studies.[15]

While the inclinometer used in this study was used previously in other studies,[13,15] it is acknowledged that there are a few limitations of the device in measuring joint-position sense. To limit the amount of tactile feedback, we fixed the device to the subject solely with a Velcro strap. Because the inclinometer is attached only with this strap and because there are no external devices to stabilize the shoulder, the extremity is free to move in any plane of movement. If the extremity moved out of the sagittal plane, the inclinometer would be raised on 1 side and the weighted needle of the inclinometer would not lie level. To ensure movement in the respective plane of motion, the subjects were instructed to maintain their arm in the proper position and demonstrate proper motion before the joint-reposition-sense testing.

Furthermore, only immediate effects of the shoulder kinesiology tape were observed in this study. Consequently, any long-term effects are unknown and should be investigated in future studies. Finally, we did not blind the investigator to participant group; however, this study is the first to document that kinesiology tape improves joint-reposition sense in healthy individuals and provides a basis that future studies may build on. As part of the inclusion criteria, participants had to be healthy, with no history of shoulder pathologies; therefore, our findings may not translate to injured populations. A recent study showed that the application of kinesiology tape failed to improve knee proprioception in a group of healthy women; however, kinesiology tape provided significantly improved proprioception after uphill walking in healthy women with poor proprioceptive ability.[24] This may support its use in sports medicine for preventing injuries or assisting with the rehabilitation of an injured athletes. Future studies should evaluate the role of kinesiology tape in injured athletes and how it may influence injury prevention. In addition, it may be useful to include a sham tape that may help differentiate between the effects of kinesthetic tactile feedback from the sham tape on the skin compared with the specific feedback and role of kinesiology tape on the skin. Using a kinesiology tape applied to the skin without any stretch or positional patterns as the "placebo" group would prevent the participants from knowing which taping method was being applied, allowing for a blind between taping groups.

Conclusion

Kinesiology tape significantly reduced joint-reposition-sense errors for shoulder flexion and external rotation. As demonstrated by the reduced variability in external-rotation and flexion joint-reposition-sense errors, kinesiology tape may add a clinical benefit of improving proprioception. Further research should include application of kinesiology tape with different methods and different body parts and joints. It is also important to evaluate the effects of kinesiology tape on injury prevention. This will improve our understanding of kinesiology tape and provide a basis for a clinically sound evidence-based practice.

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