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# The Clinical Efficacy of Kinesio Tape for Shoulder Pain: A Randomized, Double-Blinded, Clinical Trial

Shoulder pain is a very common musculoskeletal complaint, and individuals with shoulder pain comprise a significant percentage of patients seeking medical attention. Lifetime prevalence of shoulder pain has been reported to range from 7% to 36% of the population.<sup>11,13</sup> Rotator cuff pathology and subacromial impingement are among the most common diagnoses made in the shoulder region.<sup>11,19</sup> The vast majority of

these cases are initially treated nonoperatively. This places physical therapy as a likely first line of treatment for this

problem. The clinical efficacy of several different treatment regimens have been studied.<sup>10,13,19,28,32</sup> However, a recent sys-

tematic review reveals a lack of high-quality clinical trials in this area.<sup>11</sup>

Taping is widely used in the field of rehabilitation as both a means of treatment and prevention of sports-related injuries.<sup>2,16,21,22,24,33</sup>

The essential function of most tape is to provide support during movement. Some believe that tape serves to enhance proprioception and, therefore, to reduce the occurrence of injuries.<sup>6,25,38</sup> The most commonly used tape applications are done with nonstretch tape. The rationale is to provide protection and support to a joint or a muscle.<sup>1,30</sup> Utilizing Leukotape and CoverRoll stretch tape, investigators have shown clinical improvement in patients with grade III acromioclavicular separations, anterior shoulder impingement, and hemiplegic shoulders.<sup>12,16,31</sup>

In recent years, the use of Kinesio Tape (KT) has become increasingly popular.<sup>20</sup> KT was designed to mimic the qualities of human skin. It has roughly the same thickness as the epidermis and can be stretched between 30% and 40% of its resting length longitudinally. Kase et al<sup>20</sup> have proposed several benefits, depending on the amount of stretch applied to the tape during application: (1) to provide a positional stimulus through the skin, (2) to align fascial tissues, (3) to create



- **STUDY DESIGN:** Prospective, randomized, double-blinded, clinical trial using a repeated-measures design.
- **OBJECTIVES:** To determine the short-term clinical efficacy of Kinesio Tape (KT) when applied to college students with shoulder pain, as compared to a sham tape application.
- **BACKGROUND:** Tape is commonly used as an adjunct for treatment and prevention of musculoskeletal injuries. A majority of tape applications that are reported in the literature involve nonstretch tape. The KT method has gained significant popularity in recent years, but there is a paucity of evidence on its use.
- **METHODS AND MEASURES:** Forty-two subjects clinically diagnosed with rotator cuff tendonitis/impingement were randomly assigned to 1 of 2 groups: therapeutic KT group or sham KT group. Subjects wore the tape for 2 consecutive 3-day intervals. Self-reported pain and disability

- and pain-free active range of motion (ROM) were measured at multiple intervals to assess for differences between groups.
- **RESULTS:** The therapeutic KT group showed immediate improvement in pain-free shoulder abduction (mean  $\pm$  SD increase,  $16.9^\circ \pm 23.2^\circ$ ;  $P = .005$ ) after tape application. No other differences between groups regarding ROM, pain, or disability scores at any time interval were found.
  - **CONCLUSION:** KT may be of some assistance to clinicians in improving pain-free active ROM immediately after tape application for patients with shoulder pain. Utilization of KT for decreasing pain intensity or disability for young patients with suspected shoulder tendonitis/impingement is not supported.
  - **LEVEL OF EVIDENCE:** Therapy, level 1b-.  
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  - **KEY WORDS:** *impingement, rehabilitation, taping*

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more space by lifting fascia and soft tissue above area of pain/inflammation, (4) to provide sensory stimulation to assist or limit motion, and (5) to assist in the removal of edema by directing exudates toward a lymph duct. KT is unique in several respects when compared to most commercial brands of tape. It is latex free and the adhesive is 100% acrylic and heat activated. The 100% cotton fibers allow for evaporation and quicker drying. This allows KT to be worn in the shower or pool without having to be reapplied. Lastly, prescribed wear time for 1 application is longer, usually 3 to 4 days.

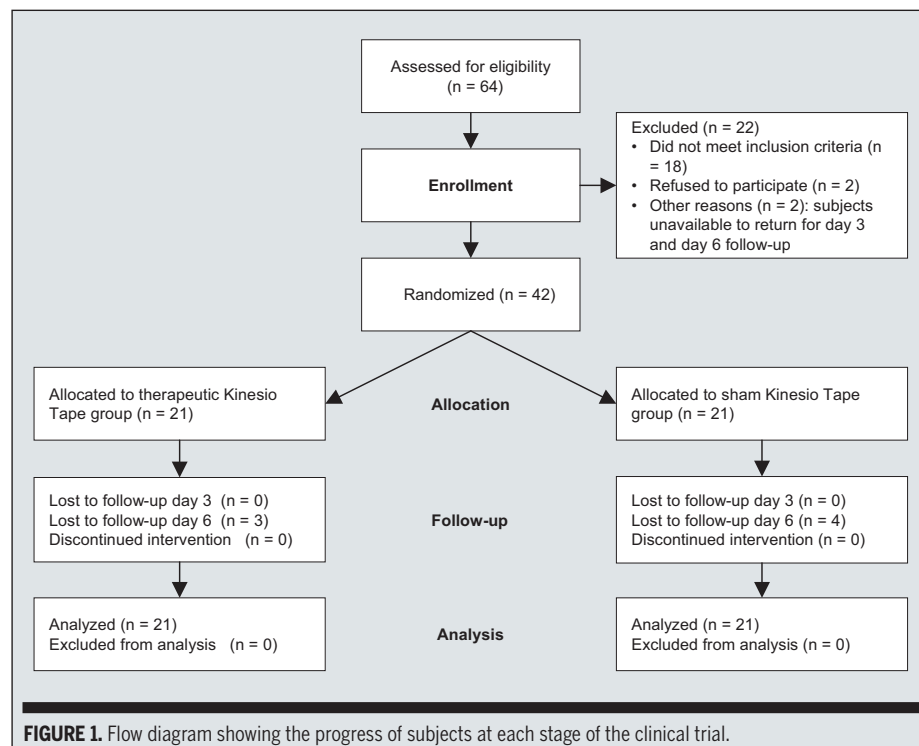
KT can be applied to virtually any muscle or joint in the body. However, minimal evidence exists to support the use of this type of tape in the treatment of musculoskeletal disorders.<sup>14</sup> The limited information on KT tape application suggests improved function, pain, stability, and proprioception in pediatrics<sup>36</sup> and patients with acute patellar dislocation,<sup>27</sup> stroke,<sup>18</sup> ankle<sup>26</sup> and shoulder pain,<sup>8</sup> and trunk dysfunction.<sup>37</sup> This information comes from case series and small pilot studies and thus represents lower levels of clinical evidence.

There appears to be at least some merit for the use of KT as a treatment adjunct, but to our knowledge there are no published randomized clinical trials that evaluate the effects of KT for any musculoskeletal complaint. The purpose of this study was to compare the short-term effect of a therapeutic KT application on reducing pain and disability in subjects with shoulder pain (clinically diagnosed as rotator cuff tendonitis/impingement) as compared to sham KT application.

## METHODS

### Subjects

**A**LL PATIENTS PRESENTING TO THE Cadet Physical Therapy Clinic at the United States Military Academy or Keller Army Community Hospital at West Point, NY between September 2006 and September 2007 with a primary complaint of shoulder pain were considered



**FIGURE 1.** Flow diagram showing the progress of subjects at each stage of the clinical trial.

for enrollment in the study. Screening was performed by 4 physical therapists, all with a minimum of 5 years of clinical experience in outpatient orthopedic settings. Upon clinical exam, the inclusion criteria were (1) pain onset prior to 150° of active shoulder elevation in any plane, (2) positive empty can test indicating possible supraspinatus involvement, (3) positive Hawkins-Kennedy test indicating possible external impingement, (4) subjective complaint of difficulty performing activities of daily living, and (5) being 18 to 50 years of age. The exclusion criteria were shoulder girdle fracture, glenohumeral dislocation/subluxation, acromioclavicular sprain, concomitant cervical spine symptoms, a history of shoulder surgery within the previous 12 weeks, or shoulder pain for longer than 6 months. The exclusion criteria were chosen in an attempt to increase the homogeneity of selected subjects and to eliminate subjects with pathology that would be less likely to respond to the selected taping intervention. Enrollments were only made by the primary author, who ensured that each subject met all 5 inclusion criteria. We enrolled 42 sub-

jects into the study (**FIGURE 1**). All subjects were college students enrolled at the United States Military Academy and ranged from 18 to 24 years of age.

The primary author is a certified KT practitioner and applied all the taping procedures. To avoid bias, the second author, who was blinded to the group assignment, measured outcomes. Informed written and verbal consent were obtained from all subjects before enrollment, and all rights of the subjects were protected. The procedures for this study were approved by the Institutional Review Board of Keller Army Community Hospital at West Point, NY.

### Taping Techniques

Subjects were assigned to 1 of 2 groups using a random-number generator and allocation was concealed. The treatment group received a standardized therapeutic KT application (**FIGURE 2**). The general application guidelines were consistent with the protocol for rotator cuff tendonitis/impingement suggested by Kase et al.<sup>20</sup> Standard 2-in (5-cm) beige Kinesio Tex tape was used for all applications in both groups. The first



FIGURE 2. Therapeutic Kinesio Tape application.



FIGURE 3. Sham Kinesio Tape application.

strip was a Y-strip representative of the supraspinatus, which was applied from its insertion to origin with paper-off tension. A Y-strip refers to a section of tape that has a portion cut down the middle to produce 2 tails. Paper-off tension means applying the tape directly to the skin as it comes off the paper backing. KT is manufactured and applied to its paper backing with approximately 15% to 25% stretch.<sup>20</sup> The first strip was applied with the subject in a position combining cervical side bending to the contralateral side and the arm reaching behind the back as if reaching into the contralateral back pocket. The second strip was a Y-strip representative of the deltoid, also applied from insertion to origin with paper-off tension. The second strip was applied with the first tail to the anterior deltoid while the arm was externally rotated and horizontally abducted. The tail for the posterior deltoid was applied with the arm horizontally adducted and internally rotated as if reaching to the outside of the contralateral hip. The third strip, approximately 20 cm in length, was either an I-strip (no cut down the middle of the tape) or a Y-strip, depending on shoulder contour. It was applied from the region of the coracoid process around to the posterior deltoid with a mechanical correction (approximately 50% to 75% stretch and downward pressure applied to the KT) at the region of perceived pain or tenderness. The mechanical correction technique was applied with the upper extremity externally rotated while at the side. The upper extremity was then

moved into shoulder flexion and slight horizontal adduction as the end of the tape was applied with no stretch.

The sham KT group received a standardized, neutral KT application (FIGURE 3). The sham taping consisted of two 4-in (10-cm) I-strips applied with no tension. They were essentially placed on the skin after the paper backing was completely removed, 1 over the acromioclavicular joint in the sagittal plane and 1 on the distal deltoid in the transverse plane. In many studies that utilize sham taping for comparison, the application usually looks very similar but has all the therapeutic elements removed from the process. When we attempted to apply the KT in that manner during the design phase of this study, 2 test subjects (patients with shoulder pain consistent with subacromial impingement) complained of a very minor sensation of skin shear discomfort at higher ranges of shoulder elevation and rotation. Consequently, we developed the alternative sham-taping application used in this study that we are more confident provided the desired neutral treatment effect. The sham group sites were selected because they are the most common locations of perceived pain by patients with rotator cuff tendonitis or impingement. Although the taping applications looked different, they were well concealed under short-sleeve clothing. Therefore, we do not believe that blinding of the subjects was compromised. This was confirmed by all subjects stating that they were unaware of their group assignment at the end of the study.

## Outcome Measures

We utilized 3 primary outcome measures: the Shoulder Pain and Disability Index (SPADI), pain-free active range of motion (ROM), and a 100-mm visual analogue scale (VAS) to assess pain intensity at the endpoint of pain-free active shoulder ROM. All measures were obtained at baseline, immediately after taping (except the SPADI), 3 days and 6 days after tape application. The SPADI is a 13-item questionnaire that consists of 2 subscales for pain (5 items) and disability (8 items), which is scored by taking an average of the 2 subscales. Scores range from 0 to 100, with higher scores indicating greater pain and disability. The SPADI has been studied extensively and determined to be a valid and reliable instrument that is responsive to change.<sup>3,15,23,34</sup> The minimal clinically important change has been defined as greater than a 10-point decrease in score.<sup>34</sup> We used a 10-point change by day 6 to define success.

Shoulder ROM measurements of forward flexion, abduction, and scapular plane elevation were taken using a standard goniometer. Pain-free active ROM was designated as the ROM attained at the “point of first onset of pain.” We utilized a 100-mm VAS to record the pain intensity experienced at the end point of the pain-free active ROM test. We defined meaningful change as a subject that showed a 15° increase in pain-free active ROM. A 2-point reduction on the 11-point numerical pain rating scale (NPRS) has been shown to be of clinical importance.<sup>7</sup> We therefore established that a 20-mm decrease on the VAS by day 6 would be considered a meaningful change in this study.<sup>7</sup>

## Sample Size Determination

A priori power analysis demonstrated the need for at least 26 subjects per group, given a standard deviation of 25 mm (VAS), a difference in pain intensity between groups of 20 mm on the VAS, an alpha level of .05, and a power set at 80%.<sup>29</sup>

## Procedure

Each subject had ROM and VAS measures completed before and after the initial tape application. Subjects who were prescribed a nonsteroidal anti-inflammatory drug (NSAID) prior to enrollment in the study were instructed to take the medication as directed. Subjects who were not prescribed or taking an over-the-counter NSAID or analgesic were instructed to avoid doing so for the duration of the study. In an effort to control for activity level, all subjects were issued a limited-duty physical profile that excused them from performing upper extremity exercises for 1 week. Subjects were then instructed to wear the tape for 48 to 72 hours and to return to the clinic for re-evaluation 12 to 24 hours after removing the tape. Subjects were instructed to remove the tape prior to the prescribed time only if any persistent skin irritation or increased shoulder discomfort occurred. At the day 3 follow-up we inspected the subjects' skin and reassessed their primary outcome measures. Subjects were then taped with the same technique used previously, based on their group assignment, and instructed to wear the tape for an additional 48 to 72 hours. Again with the tape removed for approximately 12 to 24 hours, all subjects were instructed to return to the clinic on day 6 for the final evaluation. After the final outcome measures were obtained, subjects were disenrolled from the study and we continued to treat them as clinically indicated.

## Data Analysis

We used a group-by-time 2-way mixed-model analysis of variance (ANOVA) with time as the repeated factor. Descriptive statistics were calculated for both groups at 4 time intervals: baseline (before taping), immediately after taping, day 3, and day 6. The SPADI was only measured once at the time of the initial visit, as the score would not be expected to change immediately after taping. Seven subjects (3 from the treatment group and 4 from the sham group) failed to return for day 6 re-evaluation. All 7 subjects improved and did not seek further care for their

TABLE 1	BASELINE CHARACTERISTICS OF SUBJECTS*	
	Sham KT Group (n = 21)	Treatment KT Group (n = 21)
Duration (d)	8 (5-30)	19 (5-35)
Age (y)	19.8 (1.5)	21.3 (1.7)
Males (n)	17	19
Females (n)	4	2
NSAIDs <sup>†</sup>	8	7
SPADI pain subscale	43.7 (14.0)	46.5 (14.2)
SPADI disability subscale	24.2 (17.9)	28.4 (19.4)
SPADI total score	34.0 (13.9)	37.4 (15.2)
VAS (mm)	43.9 (21.7)	44.1 (20.1)
ABD (°)	110.1 (31.4)	93.8 (35.7)
FF (°)	114.7 (23.0)	106.7 (35.8)
SCAP (°)	118.9 (29.0)	106.1 (36.7)

*Abbreviations: ABD, pain-free abduction; FF, pain-free forward flexion; KT, Kinesio Tape; NSAIDs, nonsteroidal anti-inflammatory drugs; SCAP, pain-free scapular plane elevation; SPADI, Shoulder Pain and Disability Index; VAS, visual analogue scale (based on 100-mm scale).*  
*\* Data are mean ± SD, except for duration, which is presented as median (interquartile range), and gender and NSAIDs, which are count.*  
*† Subjects taking prescribed NSAIDs at the start of the study.*

shoulder pain, citing busy class schedules as the reason for not returning to complete the study. We decided to account for the missing data from day 6 by performing an intention-to-treat analysis utilizing the last observation carried forward (LOCF) model.<sup>5,9</sup> This technique involves using the last recorded value for each outcome measure and applying it to the remaining missing value(s). Multivariate analyses of variance (MANOVAs) were utilized to determine any differences between the mean change scores of each group regarding VAS, ROM, and SPADI at each time interval. However, the SPADI was not included in the day 1 MANOVA, as it was only calculated once at baseline and no change score was available for comparison. The F value used was based on Wilks' lambda. When the MANOVA demonstrated a significant effect, a follow-up univariate ANOVA was performed. Results of the MANOVA were regarded as significant at a P value of less than .05, and to protect against the possibility of type I error the alpha level of the ANOVA was set at .01. All statistics were calculated using SPSS, Version 11.5.0 software (SPSS Inc, Chicago, IL).

## RESULTS

**B**ASELINE CHARACTERISTICS AND initial assessment of each outcome measure of the subjects are shown in **TABLE 1**. No meaningful differences existed between groups at baseline. The mean age of all subjects was 20, and the median duration of symptoms was 15 days (interquartile range, 5-30 days). A summary of change scores and mean differences for each of the outcome measure are presented in **TABLE 2**. Negative change scores on VAS and SPADI are indicative of improvement; whereas positive change scores for ROM indicate improvement. The sham KT group showed no immediate change in any of the outcome measures, indicating that the sham KT application likely provided a neutral treatment effect as desired. The day 1 MANOVA revealed a significant main effect for group regarding the mean change scores ( $F_{4,37} = 2.64$ ;  $P = .049$ ). Univariate ANOVA was then conducted to find where a difference existed. The only difference found at day 1 was that the change score for pain-free shoulder abduction ROM in the treatment group



showed a significant improvement when compared to the sham group ( $F_{1,41} = 8.8$ ;  $P = .005$ ). It demonstrated a mean difference of 19.1° (99% CI: 1.7, 36.5) between groups. A repeated-measures MANOVA, which included the SPADI mean change scores, was again calculated for the day 3 and day 6 data. A main effect for change over time ( $F_{5,36} = 9.3$ ,  $P \leq .001$ ) was demonstrated as both groups significantly improved in all outcome measures by day 6 and exceeded the predetermined criteria for success. However, no main effect for group ( $F_{5,36} = 1.3$ ,  $P = .28$ ) or group-by-time interaction effect ( $F_{5,36} = .76$ ,  $P = .58$ ) was observed. No subjects needed to remove the tape earlier than instructed. Two subjects demonstrated a mild, nonpruritic rash at day 6, which resolved within 24 to 48 hours of tape removal. Otherwise, no adverse effects were noted.

## DISCUSSION

VARIOUS AUTHORS HAVE PREVIOUSLY reported improvements in function, pain, and ROM through the use of KT.<sup>8,18,26,27,37</sup> As these reports were either performed on healthy subjects or were case series, this literature represents low level of evidence; however, it points to the need for further investigation. The purpose of this study was to compare the short-term efficacy of therapeutic KT application on reducing pain and disability in subjects with shoulder pain due to rotator cuff tendinitis as compared to sham KT application. Our results are partially consistent with previous reports showing that KT can have a positive effect on ROM when thought to be limited by musculoskeletal shoulder pain.<sup>8</sup> The immediate statistically significant difference between groups no longer existed by day 3. These findings may indicate that the potential benefits of KT application are limited to partially improving pain-free ROM of shoulder abduction immediately after application. No short- or long-term benefit related to pain or function occurred over the 6-day period of tape application.

TABLE 2		CHANGE SCORES COMPARED TO DAY 1 PRETAPE APPLICATION		
Time	Sham KT (n = 21)*	Treatment KT (n = 21)*	Mean Difference (99% CI)†	
Day 1 ABD	-2.2 (18.3)	16.9 (23.2)‡	19.1 (1.7, 36.5)	
Day 3 ABD	9.4 (23.4)	26.0 (27.7)§	16.6 (-4.1, 38.7)	
Day 6 ABD	25.7 (23.1)§	36.0 (33.9)§	10.3 (-13.9, 34.5)	
Day 1 FF	0.9 (14.1)	7.6 (10.9)	6.8 (-3.7, 17.3)	
Day 3 FF	11.6 (15.3)	17.2 (19.2)	5.6 (-8.8, 20.1)	
Day 6 FF	20.3 (15.3)§	29.2 (26.3)§	8.9 (-9.1, 26.8)	
Day 1 SCAP	0.7 (12.0)	8.7 (17.7)	8.0 (-4.6, 20.6)	
Day 3 SCAP	9.9 (15.2)	20.2 (26.4)§	10.3 (-7.6, 28.3)	
Day 6 SCAP	20.4 (21.9)§	25.9 (28.1)§	5.4 (-15.6, 26.5)	
Day 1 VAS	-2.9 (6.4)	-9.1 (13.0)	-6.1 (-14.7, 2.4)	
Day 3 VAS	-19.8 (15.3)	-16.0 (21.1)	3.8 (-11.6, 19.2)	
Day 6 VAS	-27.1 (18.1)§	-23.7 (22.8)§	3.3 (-13.8, 20.5)	
Day 3 SPADI total score	-12.2 (12.1)	-13.1 (13.9)	-0.9 (-9.9, 11.8)	
Day 6 SPADI total score	-18.8 (13.8)§	-21.0 (16.2)§	-2.2 (-14.7, 10.4)	

Abbreviations: ABD, pain-free abduction; CI, confidence interval; FF, pain-free forward flexion; KT, Kinesio Tape; SCAP, pain-free scapular plane elevation; SPADI, Shoulder Pain and Disability Index; VAS, visual analogue scale (based on 100-mm scale).

\* Data presented as mean (SD).

† Calculated as treatment group minus sham group.

‡ Indicates a statistically significant difference between groups ( $P < .01$ ).

§ Indicates that the measure exceeded predetermined meaningful clinical change.

The physiological mechanisms by which KT is presumed to work remain hypothetical, and we can only speculate what they might be. In this study, pain-free abduction ROM in the treatment group immediately improved without a concurrent significant improvement in pain intensity at the end point of pain-free active ROM. Pain modulation via the gate control theory is one plausible explanation for such a change, because it has been proposed that tape stimulates neuromuscular pathways via increased afferent feedback.<sup>21</sup> Under the gate control theory an increase in afferent stimulus to large-diameter nerve fibers can serve to mitigate the input received from the small-diameter nerve fibers conducting nociception. Another possibility is that the improved motion might have been due to an increase in supraspinatus motor units recruited to perform the activity due to an increased proprioceptive stimulus. However, this proposition has not been supported by recent publications, which showed that there was no

significant increase in muscular activity measured with electromyography after taping.<sup>1,6</sup> The immediate effect on ROM may also have been potentially due to KT guiding the shoulder through an arc of improved glenohumeral motion, which reduced mechanical irritation of the involved soft tissue structure(s). Lastly, the possibility that some component of the overall observed effect is that of a placebo effect must also be considered. Further research is required to better understand the mechanisms at play for the initial improvement in abduction ROM.

Pain and disability measures, as a result of taping, were not different between groups in our study. This is in contrast with other published literature using similar outcome measures.<sup>8,36</sup> This lack of agreement could be due to a number of factors. Although the 2 previous studies were also short term, they were both case series and had no control group, making it difficult to ascertain causation. Also, some of our subjects reported lower initial SPADI and VAS scores, leav-

ing minimal room to demonstrate significant improvement when the groups were compared.

A majority of subjects improved and no longer required care within 4 weeks after completion of the study. However, 7 subjects who did not respond to the taping technique (3 KT, 4 sham) continued to seek care for recalcitrant shoulder pain after the conclusion of their participation in the study. On MRI, 3 of these subjects had an anterior labral tear and 3 had a posterior labral tear. All but 1 of these subjects with a labral tear went on to be treated with arthroscopic surgical repair. One subject had persistent pain that responded well to injections of infraspinatus trigger points. We performed the same statistical analysis with these subjects removed and the results were very similar. The significant improvement of pain-free abduction in the treatment group at day 1 was still present. Again, no other significant differences between groups were observed at any time interval, with the exception of a significant difference at day 1 for a greater reduction of VAS in the treatment group ( $F_{1,33} = 7.4$ ,  $P = .01$ ). However, the mean decrease was only 10 mm, and the mean difference between groups of  $-8.9$  mm (99% CI:  $-17.4$ ,  $0.1$ ) did not meet the predetermined criteria for meaningful change.

We intentionally chose not to interfere with subjects' pre-existing medical profile regarding the use of NSAIDs or analgesics. The numbers in each group taking prescribed NSAIDs at enrollment were nearly equivalent (TABLE 1).

Given this active, young, and otherwise healthy subject population, we expected a certain amount of improvement just due to time alone. However, in retrospect, based on the changes that occurred with the sham group, we may have underestimated the extent of the changes related to the natural history of the condition. The improvement noted in both groups makes it difficult to determine any specificity of effect the intended therapeutic tape application may have had over the sham application for all outcome measures in

this study. Despite the intent of the sham application to be nontherapeutic, the absence of a control group that did not receive any intervention precludes a clear determination of the origin of the improvement in that group. Improvement could have been due to natural history alone or some effect of the tape despite the intent of being a sham application, or a combination of both. A strong placebo effect of taping has been well documented in subjects with patellofemoral joint pain.<sup>4,35</sup> The lack of a control group and a seemingly near identical improvement in both groups raise the possibility that tape application might or might not have been beneficial, regardless of how it was applied.

One of the weaknesses of this study is the lack of a true control group, which would have provided a control for the condition's natural history (time) and any potential Hawthorne effect. However, it seemed more clinically useful to compare therapeutic KT application with sham KT application, as previous studies have shown positive effects of taping even when applied in what was considered a neutral, nontherapeutic manner.<sup>17,35</sup> Another potential limitation of the study was the age and underlying pathology of the subject group recruited. The subjects were young (approximate average age 20 years), which needs to be considered when generalizing our results to clinic practice. Furthermore, subjects that fall into this age category may also have concomitant shoulder laxity or instability, which was not thoroughly assessed in the study. The method of therapeutic KT application used in this study was chosen to correct for tendonitis/impingement and not necessarily instability. While, subjects with gross instability evidenced by recent dislocation or known subluxation were excluded from the study, some subjects may have had a lesser degree of joint laxity. Finally, close examination of the 99% confidence intervals in TABLE 2 for mean difference in ROM between groups, shows that these confidence intervals include the  $15^\circ$  change that had

been selected for a meaningful clinical difference in ROM. This inclusion within the confidence intervals indicates a lack of adequate power to completely rule out a small benefit of taping on changes in ROM. A similar observation can be made for the day 6 SPADI comparison. Conversely, the confidence intervals for changes in pain score do not include  $-20$  mm, showing adequate power for the variable used to determine the sample size, despite the final sample size being smaller than initially calculated.

Future clinical trials with a control group and larger sample size should be performed to investigate the effect of KT on patients with rotator cuff tendonitis/impingement, while attempting to exclude those with capsular laxity or suspected labral pathology.

## CONCLUSION

**W**HEN APPLIED TO A YOUNG, ACTIVE patient population with a clinical diagnosis of rotator cuff tendonitis/impingement, KT may assist clinicians to obtain immediate improvement in pain-free shoulder abduction ROM. However, over time, KT appears to be no more efficacious than sham taping at decreasing shoulder pain intensity or disability. ●

## KEY POINTS

**FINDINGS:** Subjects with shoulder pain and clinical diagnosis of rotator cuff tendonitis demonstrated an immediate improvement in pain-free abduction ROM after a therapeutic KT application. No other significant differences between groups were found. While both groups improved in all outcome measures by day 6, KT taping was no more efficacious than sham taping.

**IMPLICATION:** Clinicians may consider utilizing KT to assist in immediate improvement of pain-free shoulder abduction ROM when treating patients with a similar clinical presentation.

**CAUTION:** The results of this study are limited to young subjects (approximate-

ly 20 years). The lack of a control group makes it difficult to determine if similar improvement in both groups was due to natural history, placebo, and a repeated-measures study design.

## REFERENCES

- Alexander CM, Stynes S, Thomas A, Lewis J, Harrison PJ. Does tape facilitate or inhibit the lower fibres of trapezius? *Man Ther*. 2003;8:37-41.
- Birrer RB, Poole B. Athletic taping, part 4: the shoulder and elbow: added support enables the athlete to remain active. *J Musculoskel Med*. 1996;1:52-57.
- Bot SD, Terwee CB, van der Windt DA, Bouter LM, Dekker J, de Vet HC. Clinimetric evaluation of shoulder disability questionnaires: a systematic review of the literature. *Ann Rheum Dis*. 2004;63:335-341.
- Christou EA. Patellar taping increases vastus medialis oblique activity in the presence of patellofemoral pain. *J Electromyogr Kinesiol*. 2004;14:495-504. <http://dx.doi.org/10.1016/j.jelekin.2003.10.007>
- Cook RJ, Zeng L, Yi GY. Marginal analysis of incomplete longitudinal binary data: a cautionary note on LOCF imputation. *Biometrics*. 2004;60:820-828. <http://dx.doi.org/10.1111/j.0006-341X.2004.00234.x>
- Cools AM, Witvrouw EE, Danneels LA, Cambier DC. Does taping influence electromyographic muscle activity in the scapular rotators in healthy shoulders? *Man Ther*. 2002;7:154-162.
- Farrar JT, Young JP, Jr., LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain*. 2001;94:149-158.
- Frazier S, Whitman J, Smith M. Utilization of kinesio tex tape in patients with shoulder pain or dysfunction: a case series. *Advanced Healing*. 2006;Summer:18-20.
- Gadbury GL, Coffey CS, Allison DB. Modern statistical methods for handling missing repeated measurements in obesity trial data: beyond LOCF. *Obes Rev*. 2003;4:175-184.
- Gerdesmeyer L, Wagenpfeil S, Haake M, et al. Extracorporeal shock wave therapy for the treatment of chronic calcifying tendonitis of the rotator cuff: a randomized controlled trial. *JAMA*. 2003;290:2573-2580. <http://dx.doi.org/10.1001/jama.290.19.2573>
- Green S, Buchbinder R, Hetrick S. Physiotherapy interventions for shoulder pain. *Cochrane Database Syst Rev*. 2003;CD004258. <http://dx.doi.org/10.1002/14651858.CD004258>
- Griffin A, Bernhardt J. Strapping the hemiplegic shoulder prevents development of pain during rehabilitation: a randomized controlled trial. *Clin Rehabil*. 2006;20:287-295.
- Guerra de Hoyos JA, Andres Martin Mdel C, Basas y Baena de Leon E, et al. Randomised trial of long term effect of acupuncture for shoulder pain. *Pain*. 2004;112:289-298. <http://dx.doi.org/10.1177/0363546504270998>
- Halseth T, McChesney JW, DeBeliso M, Vaughn R, Lien J. The effects of kinesio taping on proprioception at the ankle. *J Sports Sci Med*. 2004;3:1-7.
- Heald SL, Riddle DL, Lamb RL. The shoulder pain and disability index: the construct validity and responsiveness of a region-specific disability measure. *Phys Ther*. 1997;77:1079-1089.
- Host HH. Scapular taping in the treatment of anterior shoulder impingement. *Phys Ther*. 1995;75:803-812.
- Hyland MR, Webber-Gaffney A, Cohen L, Lichtman PT. Randomized controlled trial of calcaneal taping, sham taping, and plantar fascia stretching for the short-term management of plantar heel pain. *J Orthop Sports Phys Ther*. 2006;36:364-371. <http://dx.doi.org/10.2519/jospt.2006.2078>
- Jaraczewska E, Long C. Kinesio taping in stroke: improving functional use of the upper extremity in hemiplegia. *Top Stroke Rehabil*. 2006;13:31-42. <http://dx.doi.org/10.1310/33KAXYE3-QWJB-WGT6>
- Johansson KM, Adolfsson LE, Foldevi MO. Effects of acupuncture versus ultrasound in patients with impingement syndrome: randomized clinical trial. *Phys Ther*. 2005;85:490-501.
- Kase K, Wallis J, Kase T. *Clinical Therapeutic Applications of the Kinesio Taping Method*. Tokyo, Japan: Ken Ikai Co Ltd; 2003.
- Kneeshaw D. Shoulder taping in the clinical setting. *J Bodywork Movement Ther*. 2002;6:2-8.
- Lewis JS, Wright C, Green A. Subacromial impingement syndrome: the effect of changing posture on shoulder range of movement. *J Orthop Sports Phys Ther*. 2005;35:72-87.
- MacDermid JC, Solomon P, Prkachin K. The Shoulder Pain and Disability Index demonstrates factor, construct and longitudinal validity. *BMC Musculoskel Disord*. 2006;7:12. <http://dx.doi.org/10.1186/1471-2474-7-12>
- McConnell J. A novel approach to pain relief pre-therapeutic exercise. *J Sci Med Sport*. 2000;3:325-334.
- Morrissey D. Proprioceptive shoulder taping. *J Bodywork and Movement Ther*. 2000;4:189-194.
- Murray H, Husk LJ. Effect of kinesio taping on proprioception in the ankle [abstract]. *J Orthop Sports Phys Ther*. 2001;31:A37.
- Osterhues DJ. The use of Kinesio Taping in the management of traumatic patella dislocation. A case study. *Physiother Theor Pract*. 2004;20:267-270.
- Paoloni JA, Appleyard RC, Nelson J, Murrell GA. Topical glyceryl trinitrate application in the treatment of chronic supraspinatus tendinopathy: a randomized, double-blinded, placebo-controlled clinical trial. *Am J Sports Med*. 2005;33:806-813. <http://dx.doi.org/10.1177/0363546504270998>
- Portney LG, Watkins MP. *Foundations of Clinical Research: Applications to Practice*. Upper Saddle River, NJ: Prentice-Hall, Inc; 2000.
- Refsauge KM, Kilbreath SL, Raymond J. The effect of recurrent ankle inversion sprain and taping on proprioception at the ankle. *Med Sci Sports Exerc*. 2000;32:10-15.
- Shamus JL, Shamus EC. A taping technique for the treatment of acromioclavicular joint sprains: a case study. *J Orthop Sports Phys Ther*. 1997;25:390-394.
- Walther M, Werner A, Stahlschmidt T, Woelfel R, Gohlke F. The subacromial impingement syndrome of the shoulder treated by conventional physiotherapy, self-training, and a shoulder brace: results of a prospective, randomized study. *J Shoulder Elbow Surg*. 2004;13:417-423. <http://dx.doi.org/10.1016/S1058274604000485>
- Wang S. *The Effect of McConnell Shoulder Taping on People With Anterior Shoulder Pain* [thesis]. Houston, TX: Texas Women's University; 1999.
- Williams JW, Jr., Holleman DR, Jr., Simel DL. Measuring shoulder function with the Shoulder Pain and Disability Index. *J Rheumatol*. 1995;22:727-732.
- Wilson T, Carter N, Thomas G. A multicenter, single-masked study of medial, neutral, and lateral patellar taping in individuals with patellofemoral pain syndrome. *J Orthop Sports Phys Ther*. 2003;33:437-443; discussion 444-438.
- Yasukawa A, Patel P, Sisung C. Pilot study: investigating the effects of Kinesio Taping in an acute pediatric rehabilitation setting. *Am J Occup Ther*. 2006;60:104-110.
- Yoshida A, Kahanov L. The effect of kinesio taping on lower trunk range of motions. *Res Sports Med*. 2007;15:103-112. <http://dx.doi.org/10.1080/15438620701405206>
- You SH, Granata KP, Bunker LK. Effects of circumferential ankle pressure on ankle proprioception, stiffness, and postural stability: a preliminary investigation. *J Orthop Sports Phys Ther*. 2004;34:449-460.



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