

The Effect of Kinesio Taping in Forward Bending of the Lumbar Spine

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Abstract. [Purpose] The aim of this study was to evaluate the influence of a lumbar fascia Kinesio Taping® technique forward bending range of motion. [Subjects and Methods] This was a longitudinal study with a randomized clinical trial composed of 39 subjects divided into three groups (control, Kinesio Without Tension-KWT, and Kinesio Fascia Correction-KFC). The subjects were assessed by Schober and fingertip-to-floor tests and left the tape in place for 48 hours before being reassessed 24 hours, 48 hours and 30 days after its removal. [Results] In all three experimental groups no significant differences were observed with the Schober test, but it was possible to observe an increase in lumbar flexion after 30 days. With the fingertip-to-floor distance assessment, the KFC and KWT groups showed significantly improved flexibility 24 hours and 48 hours after tape removal. [Conclusion] The Kinesio Taping® influenced fascia mobility, allowing for slight improvement of lumbar flexibility.

Key words: Kinesio Taping, Low back mobility, Fascia

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INTRODUCTION

The lumbar spine plays a key role in accommodating downward loads resulting from body weight distribution, muscle action, and external forces. The presence of imbalances in this region leads to instability, pain, and increased energy consumption while performing functional activities¹⁻³⁾. The lumbar fascial system supports and connects all tissues and harmonizes and organizes muscular and gravitational forces in the region⁴⁾.

In the case of fascial retraction, fascial tensions occur along with abnormal changes in tissue mobility and flexibility, which consequently leads to deterioration of movement. The fibrous connective tissue in this region has numerous mechanoreceptors that are occasionally activated to transmit sensitive and short-lived impulses. If these activations are prolonged, they quickly become oversensitive and even painful. Although individuals can withstand the initial painful symptoms, the condition is persistent and has a significant recurrence rate⁵⁾.

Low back pain has a prevalence of 80% in the general population, in which 50% of those affected recover spontaneously within two weeks and 90% recover within six weeks. However, the recurrence rate can be up to 60%⁶⁾.

The Kinesio Taping® (KT) technique uses a tape with

unique qualities, the physiological applications of which include: correcting muscle activity, improving active range of motion, improving blood and lymphatic circulation, decreasing pain by neurological suppression, and repositioning joints⁷⁻⁹⁾.

The therapy done with KT using the fascial correction technique described by Kenzo Kase aims create and/or direct fascia movement in order to guide it along a desired direction or alignment⁷⁾. Therefore, it is intended to free the fascia of any movement limitations through movement of the skin relative to target muscles by means of the mechanical tension generated by and elastic KT¹⁰⁾.

The tension imposed from this material, which deforms the fascia, stretches the bonds between molecules, promoting a gentle flow of electrons and generating a piezoelectric charge. The charge is interpreted by cells, which causes them to respond by increasing, reducing, or changing their local intercellular elements. The fascia is a tissue that will deform plastically if stretching is applied slowly enough⁴⁾.

Currently, there are few studies available KT and lumbar flexibility, especially for patients with low back pain. Other research with similar goals that have also used KT observed an improvement in range of motion and in pain reduction¹¹⁻¹⁶⁾. The current work found in the literature differs from the present study with regard to the method of application and location taped, with tape application varying along the lumbar area and in some cases extending down to the posterior region of the lower extremities.

The purpose of this study was to evaluate the influence of KT with a lumbar fascia application on the range of motion in forward bending of the lumbar spine.

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SUBJECTS AND METHODS

This was a longitudinal study composed of a randomized clinical trial and was conducted in the Universidade Estadual de Goiás from August to November of 2011. It was developed upon approval by the ethics committee for research of the Hospital for Tropical Diseases under protocol number 19/2011.

The sample consisted of 18- to 27-year-old female volunteers and physiotherapy students, who did not present any movement dysfunction and did not perform any regular physical exercises. Subjects were excluded from the study if they presented a body mass index (BMI) greater than 29, had musculoskeletal disorders or recently presented low back and spinal pain, were participants in any stretching program, and/or presented allergy to the taping material.

All the participants provided informed consent for participation in the research before the study began.

Initially, the study consisted of 45 participants randomly divided into three groups (control, Kinesio Without Tension-KWT, and Kinesio Fascia Correction-KFC) and pared according to age and BMI.

However, during the study, one subject was excluded because of an allergy to the Kinesio Taping, and five others were excluded because they did not return for the last assessments. Therefore, the final sample was composed of 39 subjects allocated into three groups containing 13 individuals each.

Lumbar flexibility was evaluated by the Schober test, marking the midpoint of the two posterior-superior iliac spines (S2 level) and then other two points 5 cm below and 10 cm above the initial level. The distance between the three points was measured in the standing position, and then the subject was instructed to bend forward for reassessment. The difference between the two measurements is an indication of the magnitude of flexion that occurs at the low back and should be at least five centimeters for lumbar mobility to be considered normal¹⁷. We also analyzed the fingertip-to-floor distance, which consisted of measuring the distance from the distal end of the third finger to the ground when the patient bent the trunk forward. The subject was considered within normal flexibility parameters for this test when the third finger was able to touch the ground¹⁸.

The original bandage brand indicated by Kinesio Taping Association International (KTAI), Kinesio Tex Gold 5 cm wide, was used to perform the KT technique.

The control group did not receive any KT application. The KWT group received the KT application with two 30 cm "I" strips while the subjects were in position of maximum forward bending of the spine. This application was performed simply by applying the tape to the skin with 0% tension. The KFC group received the same cut of tape and used the same application position as the KWT group, but the researcher applied the Kinesio Taping Fascia Correction Technique¹⁰ by utilizing short and long oscillations in order to apply a varied amount of tension of 15% to 50%. The same procedure was used for application of the second tape, as shown in Fig. 1.

The KWT and KFC subjects left the Kinesio Tape in



Fig. 1. Kinesio Taping application for fascia correction

place for 48 hours and were reassessed at 24 hours with the tape on, 48 hours with the tape on, and 30 days after tape removal.

Data were analyzed with the Statistical Package for the Social Sciences[®] (SPSS) software, version 15.0. To verify the normality of the distribution of scalar variables, the Shapiro-Wilk test was utilized, and for all the variables that had a normal distribution, a parametric test was applied. Only the value of BMI showed an abnormal distribution ($p = 0.01$), and to check the difference between the average positions of BMI groups, the Kruskal-Wallis test was used the Mann-Whitney test with Bonferroni correction significance was applied for the differences between pairs. Analysis of variance (ANOVA) was used to assess the independent sample and found the mean age between the groups. Inferential statistics were utilized to compare the means of the groups by means of ANOVA for repeated measures, which compared lumbar flexibility before and after application of KT, as well as the means of the control, KFC, and KST groups.

All the tests utilized in this research used a value of 0.05 for statistical significance and a confidence interval of 95%.

RESULTS AND DISCUSSION

The mean age of the sample analyzed was 21.23 ± 2.07 years, with the minimum being 18 years and the maximum being 27 years. From comparison of the mean age between the groups, it was concluded that there were no significant differences regarding the mean age of the subjects in each group ($p = 0.169$), thus showing age homogeneity in the whole sample.

When analyzing BMI, the average was found to be 20.71 ± 1.83 kg/m², with the minimum and maximum values being 17.21 kg/m² and 25.81 kg/m². The Mann-Whitney test with Bonferroni correction showed no homogeneity of BMI in the sample and subsequent significant differences between the KWT and KFC groups as result of the randomization process.

Because the sample was only composed of females, it differs from other studies that also included males. Although subjects were compared with in these other studies, it is not ideal to have a mixed sample, since there are differ-

ences in flexibility between men and women¹⁹).

The average Schober Test result for all participants, before application of KT, was 6.07 ± 1.2 cm. This shows that most subjects had normal lumbar spine mobility.

After applying KT, there was a reduction in the average Schober Test result in both the KWT group and the KFC group, as illustrated in Table 1. After 30 days, there was an increase in the averages in all three groups. No statistically significant differences were found between the averages obtained from the Schober Test before applying the KT, 48 hours with the tape on, and 30 days after tape removal, in any of the groups.

The average reduction after application of KT may have occurred as a result of the initial restriction to the lumbar joints due to the tape's elastic resistance. It can be inferred that the augmented flexibility witnessed 30 days after KT removal was due to possible fascia mobilization as well as improvement of local blood flow and lymphatic circulation.

This was a sample of young, healthy subjects with normal BMI values and no lumbar issues such characteristics may explain the lack of statistically significant results. Therefore, it is necessary to conduct a study with subjects presenting actual dysfunctions and abnormal situations.

The results of the present study corroborate those obtained by Salvat and Salvat (2010), who concluded that there was no significant increase in lumbar mobility, since a gain in range of motion as a result of reduction of the coxofemoral angle indicates improved flexibility of the posterior muscles of the lower extremities¹³). According to the averages obtained in the control group, as shown in Table 1, there were no significant gains in flexibility, since these individuals did not receive any taping.

Table 2 shows the results for the KWT group, and illustrates that a significantly different mean, 16.5 cm was obtained 24 hours with the tape on. Furthermore, reassessment at 48 hours with the tape on showed improvement of flexibility, with the average distance being 13.88 cm. Thus, it can be inferred that the participants showed an average

increase of 8.49 cm 48 hours when utilizing KT without tension, which make the results even more relevant. Thirty days after tape removal, the participants lost some of the acquired flexibility (1.65 cm). However, the final average (15.53 cm) remained below the baseline (22.37 cm) value. It should be noted that no significant differences were observed between flexibility values before application of KT and 30 days after its removal.

Applying KT without tension is a new modality that makes use of the Kinesio Taping Method called no tension taping. When applying the elastic fabric over stretched skin, there is a retraction response from the Kinesio Tex tape itself, which is accompanied by the return of elasticity generated by the skin. This retraction is generally used with tensions of between 10% and 25%; however, as shown at the International Symposium for Research in Kinesio Taping in Japan in 2012, retraction is present even at 0% applied tension. This KT retraction triggers a series of convolutions that provide improved blood and lymphatic fluid circulation as well as decompressions of the various local mechanoreceptors.

The results in Table 2 show that the average fingertip-to-floor distance before applying KFC group was 17.05 cm. When reassessed 24 hours with the tape on, there was increased flexibility; however, its significance was 0.059. After 48 hours with the tape on, there was an improvement in flexibility, as the average was 11.74 cm. At 30 days after tape removal, the average was 13.51 cm. Like the KWT group, the KFC group demonstrated significant differences between the values obtained before applying KT and 48 hours with the tape on. The difference between before KT and after 48 hours was 5.31 cm. During the period of one month without the KT, the individuals lost about 1.77 cm of the flexibility that they had obtained. There were no significant differences between the values obtained before applying KT and those at 30 days after tape removal.

The results also show that there were no statistical differences between the KFC and KWT groups. In other words, both groups showed improvement in lower limb flexibility during the same time interval.

In a similar study, an improvement in flexibility of 2.15 ± 2.30 was observed and found to be significant¹²). However, this result was inferior to that obtained in the present study in the KWT and KFC groups. To compare the averages of the two studies, two factors should be considered: the time the tape stayed on the skin and width of the KT that was used. The authors of the aforementioned study used a thinner tape width (2.5 cm) than in the present study (5 cm), which consequently would trigger less local mechanical and

Table 1. Average of obtained values in centimeters for the Schober's test in each group

Time/Group	Control	KWT	KFC
Before	5.88 \pm 3.2	6.51 \pm 5.1	5.90 \pm 5.3
24 hours	5.89 \pm 5.1	6.15 \pm 2.5	5.71 \pm 3.7
48 hours	5.83 \pm 3.3	5.99 \pm 2.4	5.70 \pm 3.3
30 days	6.37 \pm 4.2	6.63 \pm 3.1	6.22 \pm 4

Table 2. Average values for fingertip-to-floor distance (FFD)

Group	FFD before	FFD at 48 h with tape on	FFD at 30 days after tape removal
Control group	16.73 \pm 2.63	16.54 \pm 2.78	15.85 \pm 2.79
Kinesio without Tension (KWT)	22.37 \pm 2.63	13.88 \pm 1.66*	15.53 \pm 1.99
Kinesio Fascia Correction (KFC)	17.05 \pm 1.89	11.74 \pm 2.14*	13.51 \pm 1.99

*p<0.05

sensorial effects, and the tape application remained on the skin for only 30 minutes. These two associated factors provide a less than optimal effect than the potential of KT, as perceived in the present study, where the peak of improvement in flexibility occurred at 48 hours with the tape on.

Considering the aspects mentioned above related to the previous study and also considering the assessments made before and after the tape applications and the lack of regard for chronic influences on flexibility, the gains mentioned in the previous research may have been influenced by the fact that subjects remained in an elongated posture while application of KT was conducted, which could have contributed to a false-positive effect on the results.

Furthermore, the improvements in flexibility may have been attributed to the repeated motions performed during the sit and reach tests, which promote a reduction in connective tissue resistance that, when combined with stretching, may serve as an elasticity intensifier in the muscle-tendon unit²⁰.

Ebber and Pijnappel (2006) measured the range of motion with the sit and reach test. In their study, this test was done before applying the taping technique, immediately after its application, and after spending three days with the tape on. They utilized the “Y” cut form of application, and the tape was initially laid out on the lumbar region with subsequent bilateral positioning of its tails along the path of the sciatic nerve in 99 subjects healthy; however, they did not mention how much tension was applied. They observed a positive influence on the results after three days of use¹¹.

The effect of KT in the lower extremities, in both the experiment mentioned above and in the present study, can be justified by the formation of convolutions in the skin of the lumbar region after tape application. These in turn allow for the reestablishment of fluid flow and stimulation of the sensorimotor system^{4, 7}), just as mobilization of the tissue produces distal structural effects, since dermatomes of the lumbar and sacral region extend over to the lower extremities²¹).

By verifying the influence of KT in the lower extremities, it was deemed unnecessary to apply it to the entire lower limb, since application along the trajectory of the sciatic nerve results in values close to those obtained in this study¹¹).

We verified that the values for flexibility of the lower extremities were more significant in both the KWT and KFC groups at 48 hours with the tape on. This implies that the connective tissue does not respond immediately to external stimuli, and as they become more sustainable and repetitive, structural changes occur. On the other hand, excitable tissues differ in that they respond quickly to an external mechanical stimulus and allow for reduction of pain and increased stretching tolerance^{21, 22}).

KT, like massage therapy, has an inhibitory effect on the positive reflex amplitude that lasts only during application of the technique²¹). When either the stimulus to the mechanoreceptors or the tension to the tissue is discontinued, all aspects of the region return to their baseline values, as observed in the present study during the reassessment at 30 days after tape removal.

In general, it can be observed that the control group showed no significant improvement in flexibility and that the KWT group presented better results than the KFC group. Such results can be attributed to the method of application and the tension used during the procedure. In the KWT group, the tape was applied without any tension, which allowed the formation of more convolutions in the skin and consequently increased blood and lymphatic flow while at the same time reducing pressure on mechanoreceptors. During the fascial correction technique in the KFC group, the tension applied in KT varied from 15% (mild) to 50% (moderate), which somewhat limited the formation of convolutions and hence resulted in a lesser effect than that observed in the KWT group. From 0 to 100% tension can be applied in the Kinesio Taping Method; for muscle purposes, light tensions is used to generate only sensitive reactions, and moderate to high tension is used to generate more mechanical functions²⁴). So the above results may include some mechanical responses that could be responsible for the limited flexibility found in the KFC group.

Furthermore, we emphasize the importance of proper application by an experienced professional in order to allow for frequent and rhythmic motion. Having experience and mastery of the technique during application reduces the chances of applying tensions higher than 50%, which cause undesired effects. Another important factor to be considered is related to the amount of time that the tape stays on the skin. Since the goal in the present study was to mobilize the superficial fascia, the technique required a longer period of time to promote mobilization of this connective tissue, which happens to be time dependent.

As this study was performed with female subjects, the menstrual cycle must be considered because it coincides with significant elevations in estradiol levels²³).

The Kinesio Taping Method is a promising tool, and its use is expanding because of various therapeutic effects that have been proven through research, particularly those related to the musculoskeletal system. It is a particle technique that can be reproduced from other persons for the clinical and research purpose.

The thoracolumbar fascia is a stable structure because of the large flow of piezoelectric charges, which promote the deposition of collagen fibers and confers resistance to this tissues, and thus requires high tensions to be mobilized and stretched⁵).

Therefore, the present study found that a fascial correction technique and application without tension promoted changes in fascia mobility, allowed for discrete gains in lumbar flexibility, and had significant influences on fingertip-to-floor distance. However, to achieve better results in lumbar fascia mobilization, the use of the Kinesio Tape for longer periods of time is recommended, which would allow for greater tensions on the tissues and consequently promote better plastic adaptations. It is important to consider that the lumbar fascia is not the only reason for improvement of the lumbar flexibility. Since Kinesio Tape is an elastic bandage with moderate tension, it does not acutely trigger sufficient mechanical stress to have an impact in mobilizing the fascia. Further studies are recommended with longer periods

of tape application and with subjects that present actual myofascial dysfunctions in the lumbar region.

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