

The effect of Kinesio Taping on handgrip strength

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Abstract. [Purpose] The purpose of this research was to evaluate the change in muscle function induced by a Kinesio Tape application with no or moderate tension, to the dominant and non-dominant arms. [Subjects and Methods] This research was a quantitative study, in which 75 women participated. The subjects, aged 18–30 years, were divided into 3 groups, Kinesio, Kinesio without Tension, and Control, and they were assessed before the taping intervention and after 30 minutes, 24 hours, and 48 hours of taping. [Results] The Kinesio group subjects demonstrated an increase in handgrip strength after 30 minutes, 24 hours, and 48 hours of tape application compared to control. A statistically significant increase in strength was observed in the Kinesio group comparison to the Control after 24 hours and 48 hours for the right hand, and after 48 hours for the left hand. Improvement in the Kinesio group compared to the Kinesio without Tension was observed only after 24 hours of taping application, and only in the right hand. [Conclusion] The Kinesio Taping method augmented the handgrip strength of healthy women, and the increase in grip strength was maintained for 48 hours after its application; the dominant hand demonstrated the greatest strength values.

Key words: Kinesio Taping, Handgrip, Muscle strength

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INTRODUCTION

The search for new therapeutic approaches capable of preventing and treating musculoskeletal dysfunctions is progressively increasing in conjunction with current technological innovations. In this context, taping techniques have developed as a complement to the treatment of musculoskeletal dysfunctions, and has improved over time to provide therapeutic effects which do not hinder the functionality of a particular body segment.

In 1973, Dr. Kenzo Kase developed an elastic tape with elastic properties similar to the skin, and named it Kinesio Tape¹⁻⁴⁾. The Kinesio Taping method originated from the hypothesis that an external component could aid the functions of muscles and other tissues^{5, 6)}. It is thin and elastic by design, and can stretch to 40% to 60% of its original length, which makes it very elastic compared to traditional taping materials, allowing complete range of motion⁵⁻⁷⁾.

Various authors have described the benefits of Kinesio Taping as being dependent on the stretch of the tape and the form of placement on the skin, which elicits: positional

stimulus and correction of muscle function; improvement of fascial tissue alignment; facilitation of bodily fluid circulation; repair of injured tissues; sensory stimulation assisting or limiting movement, thereby improving proprioception; edema control by guiding lymph toward lymph nodes; and correction of joint position^{2, 5-11)}.

According to Kenzo Kase, the stretch applied to the tape creates tension in the skin which improves communication with mechanoreceptors and increases the number of motor units recruited during a muscle contraction⁹⁾. Through these effects, the tape can improve muscle function by facilitating the contraction of inactive muscles.

Therefore, the application of Kinesio Taping over the gripping musculature of the hand could possibly be used to complement therapeutic treatment of manual dysfunction once its influence has been assessed on healthy individuals. The human hand is clearly the most important and complex structure of the upper extremity due to its extensive mobility and the sensitive capabilities of its surrounding tissues, which allows gripping and feeling, its essential functions^{2, 12)}.

Due to the increasing utilization of Kinesio Tape in clinical settings, studies are necessary to confirm the purported benefits of the method and establish evidence-based standards for this technique. In light of the scarcity of research regarding Kinesio Taping, and the fundamental role of handgrip strength in activities of daily living, this study assessed the effects of Kinesio Taping on the handgrip strength of healthy women, as measured by handgrip dynamometry.

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SUBJECTS AND METHODS

This study recruited 75 healthy women volunteers, aged between 18 and 30 years, who were randomly subdivided into three groups (n=25): Kinesio, Kinesio Without Tension (KWT), and the Control groups. The Kinesio group received tape application at 25% to 35% of tension; the KWT group received tape application with no longitudinal stretch; while the Control group did not receive any taping techniques. Subjects from both the Kinesio and KWT groups were unaware of the tension utilized on their respective taping techniques to avoid possible influences on the results.

The subjects of this study were physical therapy students of the University Salgado de Oliveira in Brazil, who were invited to participate as volunteers through advertisements placed inside their classrooms. The inclusion criteria required a signed informed consent form and agreement to participate during all phases of the study.

The exclusion criteria were: outside of the established age range; absence from the 24-hour or 48-hour follow-up assessment of handgrip strength; presence of limiting factors which could have influenced the results, such as cardiopulmonary, hormonal, or osteomyoarticular disorders; joint or bone deformities, congenital or acquired, in either of the upper extremities; central or peripheral neurological deficits; use of anabolic substances; injury or surgery to the upper extremities within the last six months; or consumption of alcoholic beverages or pharmaceutical substances 24 hours prior to the start of this study.

This research was approved by the research ethics committee of the Hospital of Tropical Diseases under protocol number 009/2011.

The instrument utilized to measure handgrip strength was a JAMAR[®] dynamometer, which has been validated as a gold standard tool for this purpose by the American Society of Hand Therapists (ASHT)¹¹. This instrument allows simple and quick readings of handgrip strength, which is measured in kilograms/force. The handle was placed in the second position for the measurements¹⁴.

Initially, the subjects sat on an adjustable chair which was adjusted so that subjects backs were straight, with their knees and hips in 90° of flexion with their feet on the floor. The shoulders were positioned in adduction next to the trunk with the elbows in 90° of flexion, the forearm and wrist in the neutral position, and the arm unsupported, while the examiner held the dynamometer for each reading, as recommended by the ASHT¹⁴.

The subjects performed the handgrip movement with maximum effort, only during exhalation and after a verbal cue given by the examiner: "one, two, three, go". Three measurements were made for each hand, alternating the test sides, starting with the right hand a rest interval of 60 seconds was provided between trials in order to avoid muscle fatigue during the assessment. Subjects were instructed to maintain maximum contraction for 5 seconds in each trial, since research has demonstrate that peak force is reached between 3 to 10 seconds of contraction¹³. The average of the three trials was calculated for each hand.

Subjects from the Kinesio and KWT groups had the skin of their forearms cleaned with a cotton pad and 70% alcohol

before the application of the respective Kinesio Taping techniques. A single researcher certified in the Kinesio Taping Method conducted the taping, and pink Kinesio Tex Gold tape was used.

The technique performed for the Kinesio group aims to influence muscle function by activating the flexor digitorum superficialis muscles. The tape was initially anchored with 2.5 to 5 cm of tape at the medial epicondyle, then 25% to 35% of tension was applied as it was wound over the target muscle toward the hand. The KWT group received the same tape application, but no tension was added as the tape was applied (0% of stretch). The Control group only performed the handgrip strength assessment and did not receive any taping.

The handgrip strength dynamometry was reassessed for all groups after 30 minutes, 24 hours, and 48 hours of taping. The subjects did not exercise their gripping muscles during the 48 hours of this study.

The statistical analysis of data was performed using parametric tests. The variables were normally distributed, and the Statistical Package for the Social Science software (version 15.0) was used. Initially, a descriptive analysis of the data was conducted in order to obtain the mean, standard deviations, minimums, and maximums of the mesured items. The ANOVA test (complemented by the Student's t-test) was used to verify and compare the effects of Kinesio Taping on handgrip strength after 30 minutes, 24 hours, and 48 hours. A significance level of 5% was used in this study.

RESULTS

The initial sample size totaled 83 subjects, with an average age of 21.5 years (SD ± 2.60). None of the subjects complained of pain or discomfort during the study. Eight subjects did not participate in the study's entirety (did not return after 24 or 48 hours for reassessment of handgrip strength, or presented limiting factors which could have interfered with the results), and were excluded following the exclusion criteria, reducing the sample size to 75 healthy women.

Regarding the behavior of handgrip strength values, it was observed that only the Kinesio group presented an increase in the average values of each at the assessment times (Table 1).

It was also observed that a significant increase in strength values occurred in the right hand, compared to the initial values, after 24 hours and 48 hours of taping. For the left hand, an increase in strength was observed, compared to pre-taping, after 30 minutes 24 hours, and 48 hours of taping ($p < 0.05$).

The analysis of the data regarding the duration of taping and the different handgrip assessment times among the groups revealed there were no significant findings between the Control and KWT groups. The right hand of the group that received Kinesio Taping showed significant differences in strength from the Control group of taping, and the left hand showed a significant difference after 48 hours of taping. In comparison of the Kinesio and KWT groups only the right hand showed a significant difference after 24 hours of taping ($p < 0.05$).

In the comparison of handgrip strength between the

Table 1. Average strength of the right and left hands of the different groups (kg/F)

	Time of assessment	Kinesio group Average (\pm SD)	Control group Average (\pm SD)	Kinesio with no tension Average (\pm SD)
Right hand	Pre-taping (Baseline)	24.6 (\pm 3.5)	25.0 (\pm 3.3)	25.4 (\pm 2.9)
	30 minutes later	26.5 (\pm 3.6)*	24.4 (\pm 3.3)	25.2 (\pm 2.9)
	24 hours later	27.1 (\pm 3.5)*	24.8 (\pm 3.1)	25.2 (\pm 2.7)
	48 hours later	26.9 (\pm 3.5)*	24.3 (\pm 3.0)	25.6 (\pm 3.2)
Left hand	Pre-taping (Baseline)	23.3 (\pm 3.8)	24.3 (\pm 3.5)	25.1 (\pm 2.6)
	30 minutes later	25.9 (\pm 4.4)*	24.0 (\pm 3.2)	24.6 (\pm 2.9)
	24 hours later	26.2 (\pm 3.9)*	24.0 (\pm 2.9)	24.8 (\pm 2.9)
	48 hours later	26.2 (\pm 3.7)*	23.8 (\pm 3.3)	25.2 (\pm 2.9)

* Statistically significant ($p < 0.05$)

dominant and non-dominant hands, it was observed that the dominant hand demonstrated greater handgrip strength at all the assessment times, when considering the average dynamometry value, especially in the Kinesio and Control groups (Table 1).

DISCUSSION

Research regarding Kinesio Taping is still scarce in the scientific literature since the technique has only received international attention within the last ten years. Moreover, the available studies did not have large, homogeneous samples and were conducted with questionable methodologies. It should be noted that the present study is the first to utilize a large sample size in order to assess the effects of Kinesio Taping on muscle strength.

The primary objective of this study was to observe the influence of Kinesio Taping on handgrip strength by comparing the average handgrip strength as measured by dynamometry prior to tape application with its respective values after 30 minutes, 24 hours, and 48 hours of taping. The results demonstrate statistically significant differences after 24 hours and 48 hours of taping for the right hand, and at the three post-taping assessment times for the left hand. The results for the right hand after 30 minutes of taping revealed a p -value of 0.0575, which although the results was not significant, was very close to the level of significance adopted by this study. Similar findings were not observed in the KWT and Control groups, thus confirming the hypothesis of this study, that Kinesio Taping can increase handgrip strength when applied with systematic standards for that purpose.

According to Kenzo Kase, the Kinesio Taping method can improve the strength of muscles weakened by correcting muscle function with stimuli and reinforcement. Our present results are similar to those reported by Vithoulka et al.¹⁵⁾ in which Kinesio Taping increased eccentric muscle strength in healthy adults.

In contrast to our present results, Chang et al.¹⁶⁾ evaluated the influence of Kinesio Taping on the maximum handgrip strength of 21 healthy students, all of them men and athletes. The technique employed was specifically for medial epicondylitis, and no significant changes in strength were observed after taping. However, a confounding factor in this study was that the tension applied to the placebo group,

which was the same as that of the Kinesio group (between 15% and 20%). Also, with the start of taping being more distal than the insertion point, the tension zone was the same, thus making the purpose of comparison between these two groups questionable.

Another study investigated the immediate and delayed effects of two directions of Kinesio taping on maximal isometric strength of the wrist and finger muscles of healthy adults. Nineteen healthy junior college students participated in that study. Inhibition and facilitation KT techniques were separately used to tape the dominant and non-dominant forearms of the participants, respectively. Maximal isometric strength of wrist extension, middle finger extension, and the grip of both hands were measured before taping, immediately after taping, and after 24 h of taping (with the tape in situ). Compared with the baseline, the average maximal isometric strength of middle finger extensors increased considerably after application of the facilitation Kinesio Tape. No significant time effect was observed on the middle finger extension strength on the dominant side or on the wrist extension and grip strength on either side.

Divergences are also seen in the results presented by Fu et al.¹⁶⁾, in which Kinesio Taping was applied with 120% of longitudinal stretch over the quadriceps and hamstring muscles of 14 healthy athletes (7 men and 7 women), and assessed in the following manner: before tape application, immediately after taping, and 12 hours afterward. An isokinetic dynamometer was utilized in order to verify the muscle strength, and no significant increase was found in the muscle strength of these athletes. Rather, a decrease in strength was actually observed. An issue with the method of this study is that the actual tension applied to the tape was 120%, which should only be utilized for taping procedures of a ligamentous injury. Such a high tension may hinder muscle contraction and decrease joint mobility, which could also lead to non-functional movement and muscle inactivation.

Some authors have reported increases in electromyographic activity induced by the use of Kinesio Tape: e.g. Slupik et al.¹⁸⁾, Chen et al.¹⁹⁾, Hsu et al.⁸⁾, and Thelen, Dauben and Stoneman⁶⁾. In all of these studies, an improvement in electromyographic signals was seen.

In the above mentioned studies, there are consistency issues with the assessments of Kinesio Taping, as witnessed by the lack of a systematic approach in data collection,

which did not permit a reliable assessment of initial benefits, the duration of benefits or the residual effects after KT removal. Some authors have evaluated the influence of Kinesio Taping immediately after its application^{8, 16)}, other have assessed it immediately afterward and 12 hours later¹⁷⁾, as well as 24 hours and 72 hours later¹⁸⁾, and only after 72 hours of taping¹⁵⁾.

With regards to the stretch applied to the tape, some authors do not specify how much was utilized in their studies^{8, 19)}. Other studies simply do not follow the standards recommended by the Kinesio Taping Association. An example of this is related to the tension for muscle activation, which has been established to be between 25% and 35%. Nevertheless, some authors have opted to utilize 15% to 20% of tension¹⁶⁾ and even 120%¹⁵⁾. Also a simple tape just placed without tension as performed for the Control group in this study with no specific direction, will elicit tape stimulus and some effects should be apparent. Kinesio tape applied to the skin without tension will exert minimal tensions during body and skin movements. No tension is also used in the Kinesio Taping Method for patients that are high sensitive to external stimulus. So it can't be called placebo, it is just a different degree of stimulus.

When comparing the Kinesio and Control groups of the present study, the greatest handgrip strength values were observed in the Kinesio group at 24 hours and 48 hours after application of the taping technique to the right hand, and after 48 hours for the left hand. These results indicate that handgrip strength increased and remained elevated in the right hand for 48 hours. For the left hand, however, this increase was only observed after 48 hours of taping.

Considering that changes in handgrip strength were observed after 24 hours in the right hand, which lasted up to 48 hours, and that such changes were noted only after 48 hours of taping in the left hand, we believe that the sensitivity of the right hand is greater than that of the left hand. Therefore, the mechanoreceptor stimulus induced by the Kinesio Taping provided a faster response in the right hand than in its counterpart. The left hand possibly required greater tension and a longer period of time for it to receive sufficient stimulation to achieve the same results as for the right hand.

With regards to the augmented handgrip strength observed for the right hand of the Kinesio group in relation to the KWT group after 24 hours of taping, we assume that the tactile stimulus to the dermis and epidermis are present even when KT is applied without tension, since the skin maintains its normal mobility by stretching and recoiling in relation to the tape during upper extremity movements.

Another result noted was that the dominant hand presented greater handgrip strength when considering the average values at each of the four assessment times, namely, before Kinesio Taping application, and 30 minutes, 24 hours, and 48 hours later. This finding was observed for all the groups, but with a higher percentage in the Kinesio and Control groups.

Considering the present results, it is possible to conclude that an increase in handgrip strength occurred over pre-taping

values at 30 minutes, 24 hours, and 48 hours after Kinesio Taping application. A statistically significant increase was observed in the Kinesio group, when compared to Control group after 24 and 48 hours of taping for the right hand, and after 48 hours of taping for the left hand. Between the Kinesio and KWT groups, an increase was noted 24 hours after taping for the right hand. The dominant hand presented greater handgrip strength values in all assessments of all the groups. Accordingly, this confirms that Kinesio Taping is capable of augmenting muscle function.

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