THE EFFECT OF APPLIED DIRECTION OF KINESIO TAPING IN ANKLE MUSCLE STRENGTH AND FLEXIBILITY

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The purpose of this study was to examine the effect of applied direction of Kinesio taping (KT) in ankle range of motion and calf muscle strength. Twenty healthy subjects voluntarily participated in this study. The ankle plantar flexor muscle strength and ankle dorsiflexion ROM were assessed in knee flexion and knee extension before and after taping applied. Two applied directions, heel to posterior of knee cap (insertion to origin of calf muscles) and posterior of knee cap to heel (origin to insertion of calf muscles) were applied over both side of calf muscles, respectively. The results had not showed significantly difference in any of the results. The beneficial effects of applied direction of KT has not provided scientific evidence in this study. Future study may be able to seek other methods to identify the effect on strength or flexibility while KT applied.

KEY WORDS: Kinesio taping, strength, range of motion, ankle, tape.

INTRODUCTION: Taping technique is usually used in sports or rehabilitation (Kemler, van de Port, Backx, & van Dijk, 2011). Kinesio tape (KT) is a kind of elastic tape invented by Dr. Kase (Kase, Wallis, & Kase, 2003). Kinesio tape is a unique material which is different from other sports tapes, especially in special weave and elasticity. Its unique material mimicks the skin behavior in order for breathing of the skin and freedom of movement when the tapes are applied (Kase et al., 2003). Dr. Kase suggested the possible beneficial effects when the tapes are applied, included the following (1) improve the contraction ability of the muscle; (2) use the elasticity to create skin folds resulting in increased the space underneath the skin to improve circulation of blood and lymph; (3) to activate neurological suppression in order to reduce pain and increase joint range of motion; and (4) adjust malalignment of muscle, myofascia and joint (Kase et al., 2003; Fu, Wong, Pei, Wu, Chou, & Lin, 2008; Chang, Chou, Lin, Lin, & Wang, 2010). One of beneficial effects is improved muscle function regardless of weakened or tightened muscles. They considered that the direction of applied tape beginning at the origin to insertion of muscle resulting in the direction of muscle contracted was together with direction of tapes retracted, then the KT may assist muscle contraction and improved muscle stength; while the direction of applied tape beginning insertion to origin of muscle, which resulting in the direction of muscle contracted was opposite to direction of tapes retracted, then the KT might pull the skin or myofascia underneath the skin in the opposite direction to release the tightened area or muscles(Kase et al., 2003; Chang et al., 2010; Vithoulka, Beneka, & Malliou, 2010). These beneficial effects have not been proved. Therefore, the purpose of this study was to examine the effect of applied direction of KT in ankle range of motion and calf muscle strength.

METHODS: Twenty healthy subjects voluntarily participated in this study. Subjects were excluded if they had an injury history of lower limbs in the six months before the study. The subject's average age, body weight, body height, body mass index are shown in Table 1. The subjects were divided into two sub-groups according to average of ankle dorsiflexion range of motion (ROM) of subjects. Greater than the average of ankle dorsiflexion ROM was assigned to good flexibility group; while less than the average of ankle dorsiflexion ROM was assigned to poor flexibility group. The ankle plantar flexor muscle strength was assessed by MicroFET3 hand dynamometer in knee flexion and knee extension before and after taping applied. Ankle dorsiflexion ROM was assessed by standard goniometer in knee flexion and

knee extension before and after taping applied. The taping length measured from popliteal fossa to the heel. Two applied directions, heel to posterior of knee cap (insertion to origin of calf muscles) and posterior of knee cap to heel (origin to insertion of calf muscles) were applied over both side of calf muscles, respectively (Figure 1). The statistical analysis was undertaken using SPSS version 14.0 with significance level set as $p < 0.05$. A two way ANCOVA was used to compare the ankle dorsiflexion ROM and plantar flexor muscle strength between two taping applied direction for each group in knee flexion and extension, and the pre-test results were used as covariance.

Table 1. Basic data of subjects.

Demography	Mean±SD
Age, y	20.30±2.03
Height, cm	175.35±5.13
Weight, kg	73.28±9.76
BMI	23.82±2.87

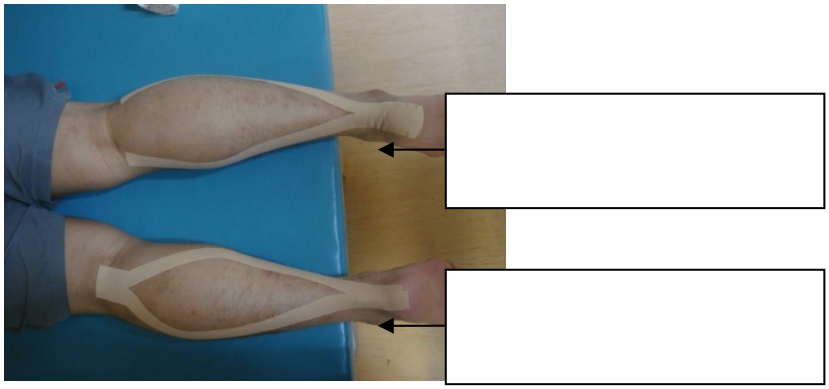


Figure 1: Taping applied over calf muscles.

RESULTS: All results are shown in Table 2 and Table 3. There were no significant differences in all the results. Figure 2 shows the change in muscle strength for poor and good flexibility group when the knee is flexed or extended. In the good flexibility group, the plantar flexor muscle strength was a trend of declined for both taping applied directions, especially when knee extended. However, in the poor flexibility group, the results also saw the trend of increased in the plantar flexor muscle strength for both taping applied directions when knee extended. Figure 3 shows the change in ankle dorsiflexion ROM for poor and good flexibility group when knee flexed or extended. The direction of origin to insertion as taping applied has shown more change in ankle dorsiflexion ROM for poor flexibility group comparing with good flexibility group; while the result of the direction of insertion to origin as taping applied has reverse effect.

Table 2: The results data in knee extension position.

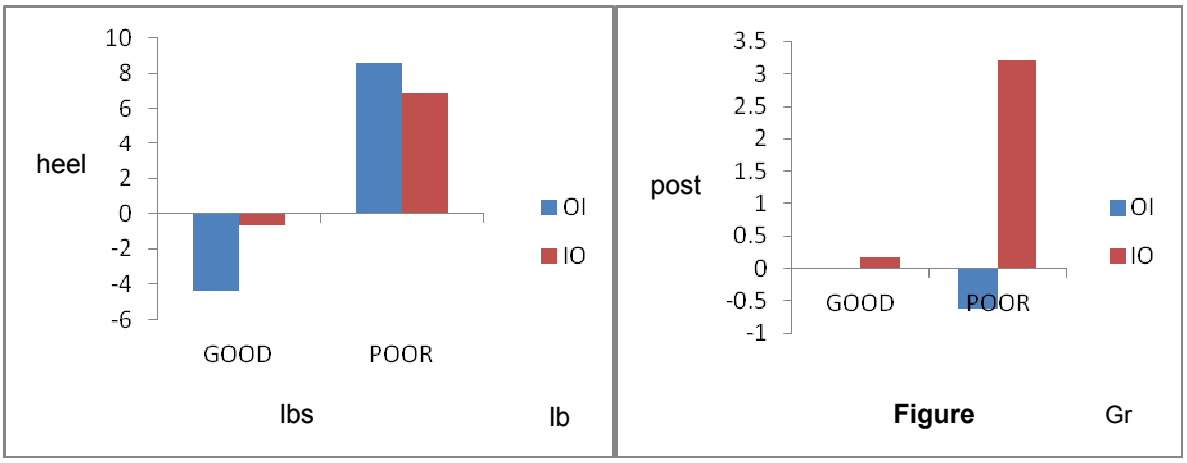
	Good group (n=10)		Poor group (n=10)	
	Pre.	Post.	Pre.	Post.
Dorsi flexion ROM (OI), deg	13.03±5.22	13.83±6.03	4.33±3.80	4.87±3.70
Dorsi flexion ROM (IO), deg	15.37±2.47	15.37±4.46	3.77±3.32	4.10±2.83
Plantar flexor MMT (OI), lbs	118.29±21.43	113.96±24.88	82.98±34.69	91.59±32.05
Plantar flexor MMT (IO), lbs	117.95±20.82	117.29±22.80	79.77±31.83	86.61±30.00

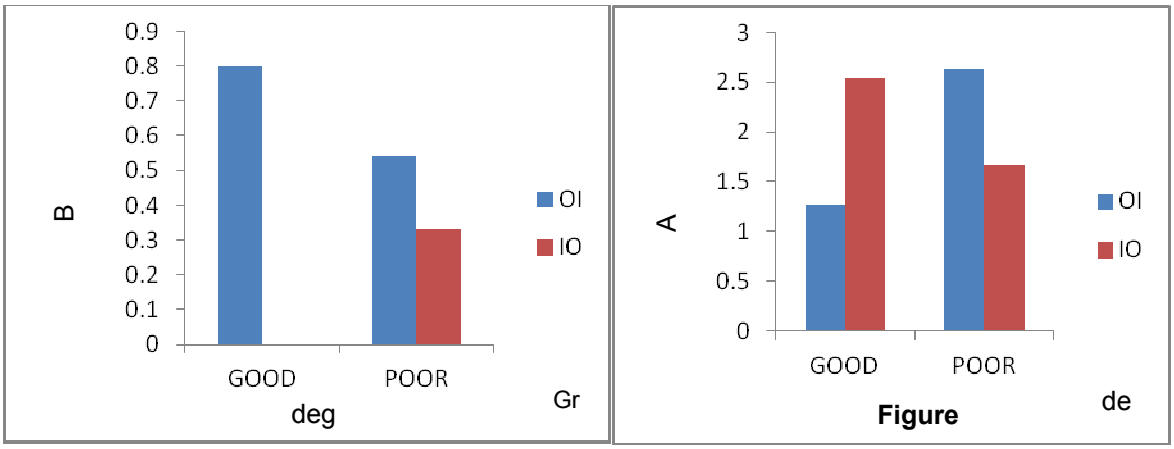
*OI: origin to insertion, IO: insertion to origin

Table 3: Result data in knee flexion position.

	Good group (n=10)		Poor group (n=10)	
	Pre.	Post.	Pre.	Post.
Dorsi flexion ROM (OI), deg	22.90±5.61	24.17±6.32	16.43±4.46	19.07±3.38
Dorsi flexion ROM (IO), deg	23.10±3.32	25.64±4.04	16.33±5.42	18.00±5.26
Plantar flexor MMT (OI), lbs	107.46±26.66	107.45±28.25	73.59±40.63	72.97±35.79
Plantar flexor MMT (IO), lbs	109.17±27.63	109.34±34.74	70.14±40.40	73.36±25.47

* OI: origin to insertion, IO: insertion to origin





Group

DISCUSSION: Although we couldn't find significant differences in all results, we still found the trend when different direction of tapes were applied for both group. Lee et al. (2010) study for grip strength was found in the dominant hand grip strength for significant differences in changes after Kinesio taping applied. Chang et al. (2010) found that the maximum grip strength had no change before and after the KT applied for healthy subjects. Also, Fu et al. (2008) had similar results for the quadriceps muscle strength in healthy

athletes. However, the taping direction was applied from origin to insertion and no significant results to confirm that the KT could assisted muscle contraction and improved muscle stength.
The direction of applied tape beginning insertion to origin of muscle, resulting in the direction of muscle contracted was opposite to direction of tapes retracted, then the KT might pull the skin or myofascia underneath the skin to opposite direction to release the tightened area of muscles and improve the flexibility. Yoshida & Kahanov (2007) applied Kinesio tape in lower trunk and found ROM of trunk flexion produced a gain of 17.8 cm compared with the non-kinesiotape group. Merino, Mayorga, Fernández, & Torres-Luque (2010) found that hip and lower back flexibility have a significant increase in sit- bend distance after KT applied. González- Iglesias, Fernández- de- Las-Peñas, Cleland, Huijbregts, & Del Rosario Gutiérrez-Vega (2009) assessed cervical range of motion before and after taping and revealed that all directions of the cervical spine movement had significantly improved. These studies also applied KT from insertion to origin direction. However, in present study there was no obvious change whatever taping applied from insertion to origin or insertion to origin. But no mater in present study or previous study, a common feature has been presented in healthy subjects participating in the study. That was also our limitation in this study. Therefore, future experiments may be able to seek other methods to identify the effect of strength or flexibility while KT applied.

CONCLUSION: The results have not shown significant differences in both tape applied direction for good or poor flexibility subjects. The beneficial effects in muscle function and flexibility of Kinesio taping has not been proven in this study. Future study may be able to seek other subjects group to identify the differences in strength or flexibility improvement.

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