

ORIGINAL RESEARCH

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COMPARISON OF THREE KINESIO TECHNIQUE APPLICATION ON JUMPING IN COLLEGIATE FEMALE ATHLETES

¹Kailash Sharma^{*2}Gaurav Shori

ABSTRACT

Background: Kinesio Tape (KT) is a somewhat new type of taping technique gaining popularity as both treatment and performance enhancement tool. Considering the fact that KT can improve muscle performance, however, limited research has been done on the different technique of strips application of KT on functional performance. Therefore purpose of this study is to compare three kinesio technique application on jumping in collegiate female athletes.

Methods: 45 healthy collegiate female athletes were recruited based on inclusion and exclusion criteria. The subjects were randomly divided into three equal groups (group I, n=15, Group II, n=15 & group III, n=15). Group I received Y application of kinesio taping, Group II received I application of kinesio taping while, Group III underwent combined Y & I application of kinesio tape on triceps surae. Pre and post measurement of vertical jump (in terms of power average, power peak) and horizontal distance were documented.

Results: Statistically significant differences were found between the difference power average, difference power peak and difference horizontal jump in group I, II and III ($p < 0.001$). Within group comparison also revealed statistically significant differences in power average, power peak and horizontal jump in all the three groups ($p < 0.001$).

Conclusion: Combined technique (Y and I) application of kinesio was more effective in improving vertical jump (power average, power peak) and horizontal jump as compared to Y and I application alone.

Key Words: Kinesio taping, Power Average, Power Peak, and Horizontal Distance

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CORRESPONDING AUTHOR

^{*2}Gaurav Shori

Associate Professor, Department of Physiotherapy, I.T.S. Paramedical College, Delhi-Meerut Road, Muradnagar, Ghaziabad, U.P, India-201206.

¹Post Graduate Student Orthopedics Physiotherapy, Department of Physiotherapy, I.T.S Paramedical College, Ghaziabad, U.P, India

INTRODUCTION

The technique of kinesio taping (KT) has been widely disseminated, especially in the field of sports. Despite being a popular therapeutic tool, it was only recently that its effects started to be investigated via randomized clinical trials.¹ Among the studies on the effectiveness of the KT technique, some have already investigated its effect on decreasing pain symptoms for patients,^{2,3,4,5} in improving ROM,⁶ support joints as well as enhancing proprioception,^{7,8}. Moreover, the elastic properties of kinesio taping can also be used for myofascial release by aligning and correcting the pattern of fascia,^{9,10} and for enhancing lymphatic drainage leading to relief of pain in severely swollen areas.¹¹

With regard to performance enhancement, the effect of kinesio taping is even more limited and mixed.^{12,13,14,15,16,17} Studies have been carried out with the purpose of verifying the effect of KT on muscle function.^{13, 17, 18} Also the physiological explanation behind KT application is scarce. It is assumed that KT can facilitate and stimulate muscle function if its application starts at the origin of the muscle and ends at its insertion.¹⁹ Another raised hypothesis is that the KT could stimulate the fascia providing higher tension to muscle facilitating the muscle contraction.¹⁷

If the hypothesis behind KT application is correct, then it is logical to expect that KT could be beneficial in activities that have a more functional approach, such as jumping. The vertical jump for example, requires a complex motor skill that involves several muscles, including the quadriceps and triceps surae. Therefore, considering the importance of the triceps surae during jumping and the suggestion that KT can improve muscle performance. Therefore, this study aim towards comparing the three kinesio technique application on triceps surae while performing vertical (VJ) and horizontal jump (HJ).

METHODS

45 collegiate female athletes who were regularly engaged in training with mean age (21.4 ± 1.37 years), mean height (154.17 ± 5.18 cms), and mean weight (49.93 ± 3.46 kgs) participated in the study. To be included, the participants had to be training at least 3 times a week at competition level and be free from vestibular or neurological changes or any musculoskeletal injury that could interfere with or contraindicate the assessment procedures. All participants signed the consent form before any data collection and experimental procedure were explained to each subject both verbally and in writing. Study protocol was approved by

Institutional ethical committee. Only dominant lower limb of the participant was assessed. Pre test measurements of vertical jump and horizontal jump were documented, before taping application.

Testing for vertical jump test

Standard procedure was used to assess athlete's performance in relation to vertical jump. The therapist recorded the best of the 3 distance and used this value to assess the player's performance in terms of power peak and power average.²⁰

Testing for horizontal jump

Standard protocol again was used to assess athlete's performance in regard to horizontal jump.²¹

Application of kinesio taping

Y Technique

15 participants of group I underwent the Y technique application from the origin of the triceps surae up to its insertion (knee region to heel). Reference point was located 4 cm below the popliteal line and 3 cm below the upper part of the posterior tuberosity of calcaneus. The point was marked on the ankle at maximum dorsiflexion. Tape color was pink, and stretching tension was 50%. Taping was applied in the following order (a) the tape was cut into a Y – strip so that each side could be taped longitudinally along the borders of the gastrocnemius. (b) both the proximal ends of the Y – strip were placed free of tension, 4 cm below the popliteal line with the ankle in the neutral position, (c) the proximal half of the strip was then stretched and placed on the calf up to the marked mid point with the participant ankle at maximum dorsiflexion, (d) the distal half of strip was also stretched and placed from the midpoint to the upper part of the posterior tuberosity of the calcaneus with the participant's ankle still at maximum dorsiflexion, (e) the distal end of the Y – strip was then placed, free of tension, with the ankle back in neutral position.¹

I Technique

15 participants of group II received, I technique application, again from the origin of the muscle to its insertion (knee region to heel), specifically on the muscle belly. Same reference points and procedure were used for tape application as it was for the Y strip application. Tape color was blue & stretching tension was again 50%.

Combined (Y & I Technique)

15 participants of group III underwent combined I & Y technique application using the same reference points, steps and procedure as the application of individual Y and I technique kinesio taping.

Post test measurements were documented again, after 30 minutes for all participants of each group I, II & III.

RESULTS

No significant differences in age, weight, and height as well as pre power average, pre power peak and pre horizontal jump were detected at the

commencement of the study. Statistically significant differences were observed in power average, power peak and horizontal jump between group I, II and III. Statistically significant differences were also observed between pre and post readings of power average, power peak and horizontal distance within group I, group II and group III.

Table 1: Comparison of mean difference of power average & power peak between group I, II & III

	Group I (Mean ± SD)	Group II (Mean ± SD)	Group III (Mean ± SD)	F Value	P Value	Post hoc (P Value)		
						1/2	1/3	2/3
Diff Power Avg	328.21 ± 50.12	211.12 ± 65.37	466.91 ± 31.45	94.914	.001	.001	.001	.001
Diff Power Peak	588.98 ± 89.94	378.85 ± 117.31	837.88 ± 56.43	94.914	.001	.001	.001	.001

Graph 1: Comparison of mean difference of power average and power peak of group I, II & III

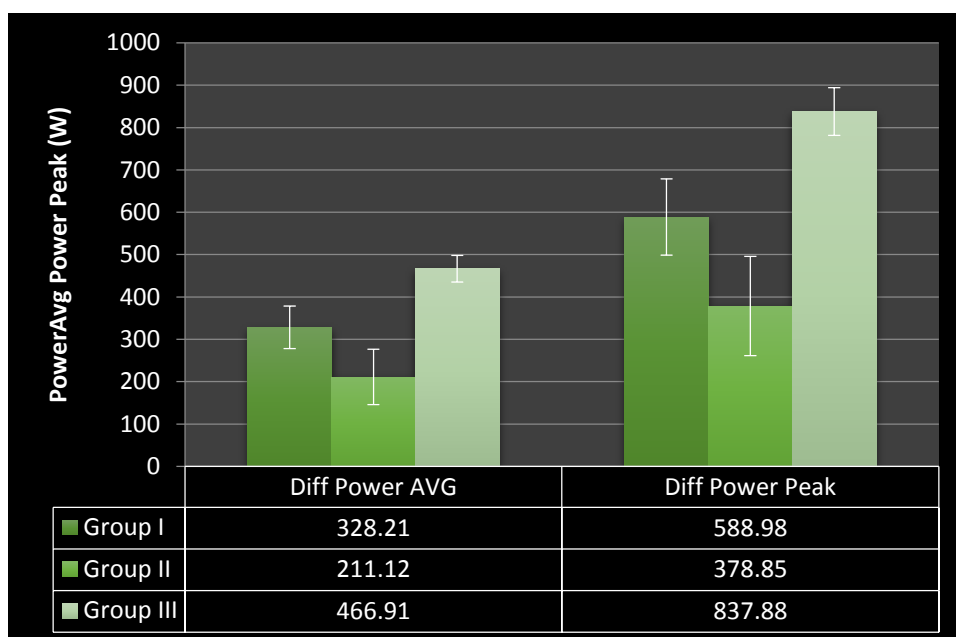


Table 2: Comparison of mean difference of horizontal jump between group I, II, & III

	Group I (Mean ± SD)	Group II (Mean ± SD)	Group III (Mean ± SD)	F Value	P Value	Post hoc (P Value)		
						1/2	1/3	2/3
Diff HJ	17.07 ± 5.36	7.0 ± 3.34	33.4 ± 3.99	142.911	.001	.001	.001	.001

Graph 2: Comparison of mean difference of horizontal Jump between groups I, II & III

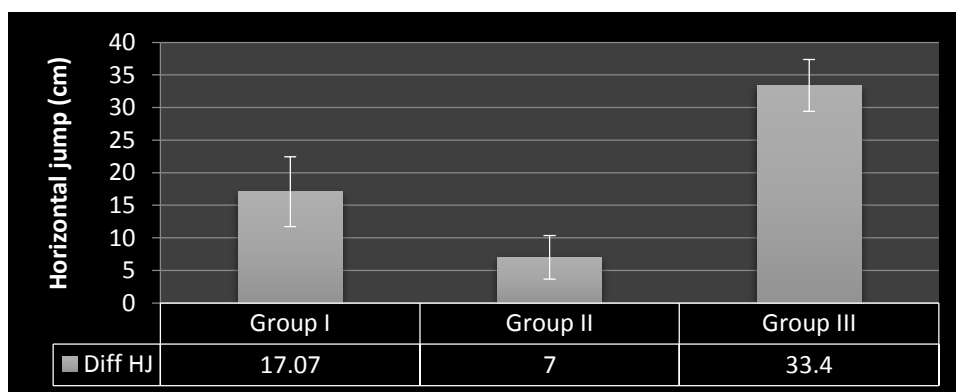


Table 3: Comparison between pre and post readings of power average and power peak within group I

	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Power Avg	448.30 ± 142.86	776.51 ± 137.85	25.364	.001
Power Peak	1109.06 ± 240.81	1698.04 ± 229.63	25.364	.001

Graph 3: Pre and post readings power average and power peak within group I

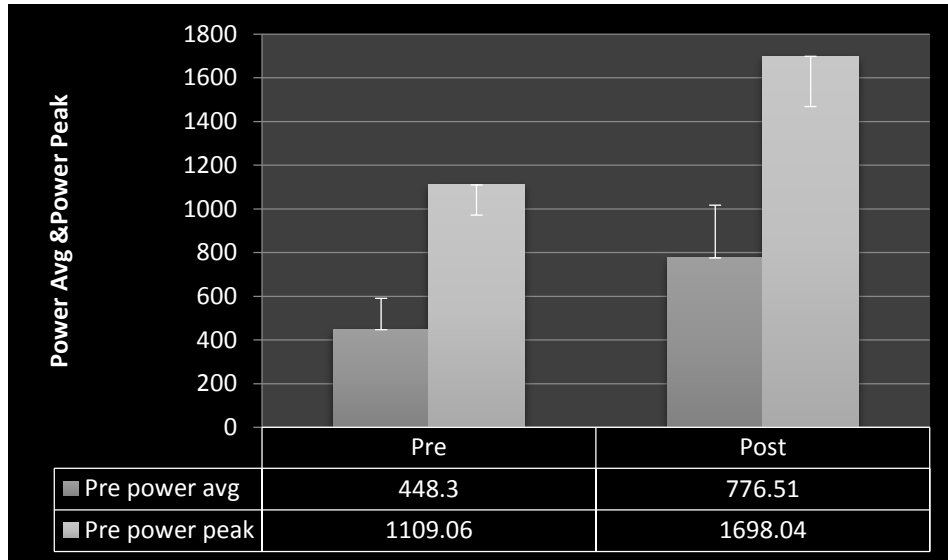


Table 4: Comparison between pre and post readings of horizontal Jump within group I

	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Horizontal Jump	100.66 ± 5.80	117.73 ± 7.06	12.321	.001

Graph 4: Pre and post reading of horizontal jump within group I

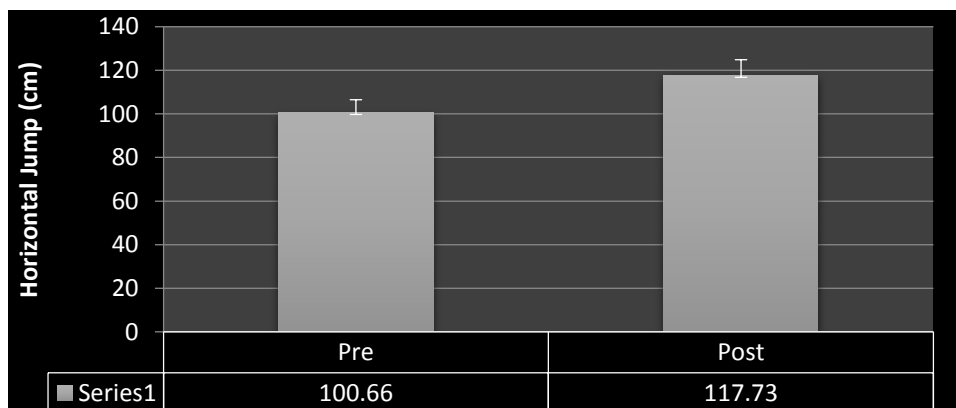


Table 5: Comparison between pre and post readings of power average and power peak within group II

Vertical Jump	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Power Avg	471.42 ± 142.30	682.54 ± 164.22	12.50	.001
Power Peak	1110.96 ± 234.55	1489.81 ± 272.61	12.50	.001

Graph 5: Pre & post readings of power average and power peak within group II

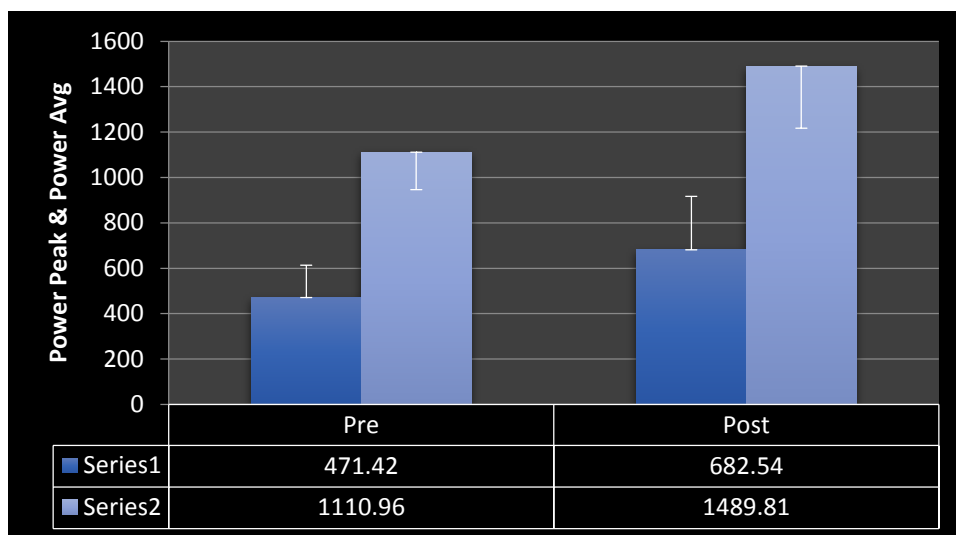


Table 6: Comparison between pre and post readings of horizontal jump within group II

	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Horizontal Jump	99.40 ± 5.44	106.40 ± 6.09	8.12	.001

Graph 6: Pre & post readings of horizontal jump of within group II

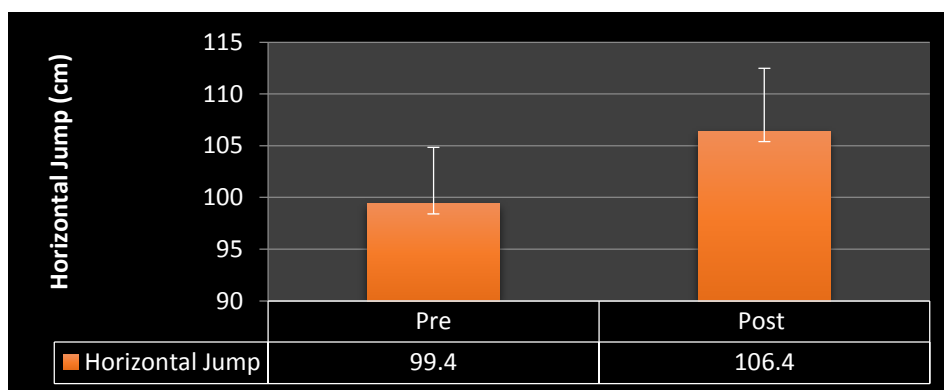


Table 7: Comparison between pre and post readings power average and power peak within group III

	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Power Avg	451.29 ± 181.59	918.20 ± 205.52	57.50	.001
Power Peak	1105.70 ± 327.57	1943.58 ± 369.75	57.50	.001

Graph 7: Pre & post readings of power average and power peak within group III

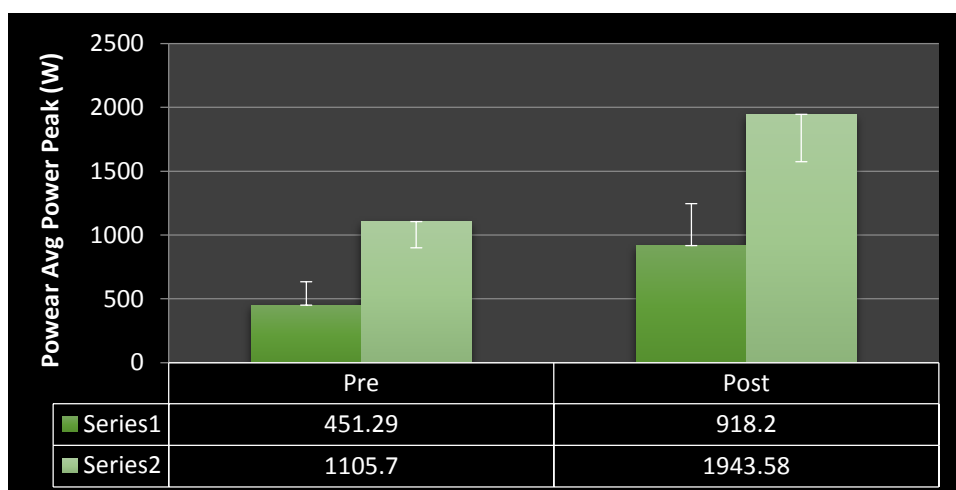
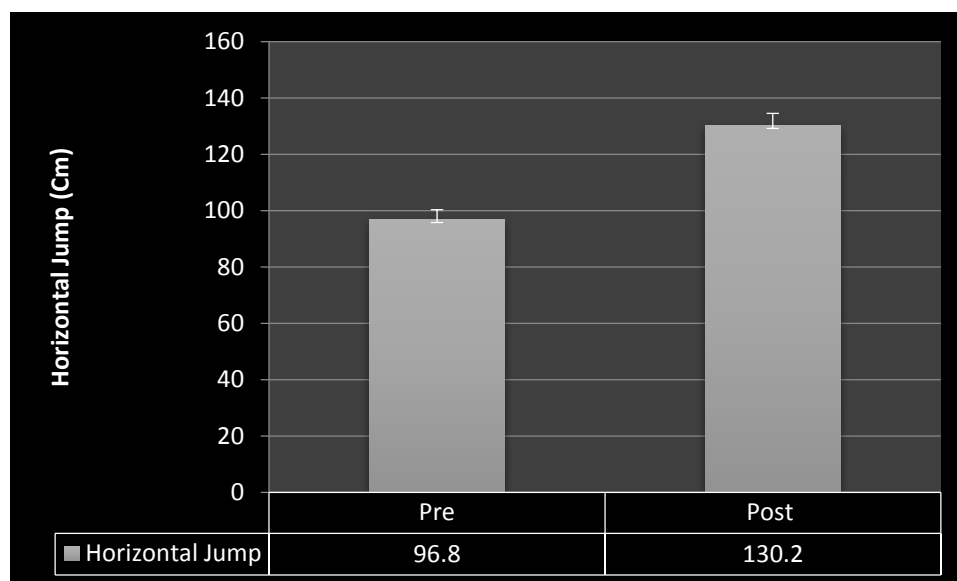


Table 8: Comparison between pre and post readings of horizontal jump within group III

	Pre (Mean ± SD)	Post (Mean ± SD)	F Value	P Value
Horizontal Jump	96.80 ± 3.54	130.20 ± 4.34	32.36	.001

Graph 8: Pre and post readings of horizontal jump within group III



DISCUSSION

Both vertical jump height and horizontal jump was evaluated as an outcome measure in the present study. Vertical jump height was measured in terms of power average (watts) and power peak (watts) whereas horizontal jump was assessed in terms of distance (cms). Maximum improvement in power average, power peak and horizontal distance was observed in group III (combined, Y & I).

One theory posits that the KT increases blood circulation in the taped area¹⁹, and increased blood flow underneath the skin may have a significant influence on muscle metabolism.²² Another theory suggests that KT stimulates cutaneous mechanoreceptors at the taped area and this tactile stimulation may affect the ROM.¹² Therefore, muscle function could be improved with KT by regulating muscle tone.²³ The ability of taping to increase muscle power in generally is affected by the direction in which the tape is attached to the skin. Tape applied to the origin and insertion of muscles helps to relax muscle tone, whereas tape applied towards the direction of muscle contraction controls and increases muscle tone by stretching the insertion area.²⁴ Moreover, the sensory input given by the combined (Y & I) strip application modulates the gamma-motor firing, which in turn leads to increased muscle tone & increased explosive muscle power.²⁵

KT application also causes interruption of pain signals responsible for pain within the CNS through the enhanced afferent stimulation of the

mechanoreceptors from the stimulus the tape provides on the cutaneous receptors which stimulates the A beta fibers. Furthermore, the interface between the tape and the cutaneous mechanoreceptors along with the continuous movement of the body activates the skins' endogenous analgesic system through stimulation of merkel cells leading to enhanced pain modulation. There is also evidence that stimulation of A beta fibers can stimulate the release of endogenous opioids with effects on pain perception through descending inhibitory pathways.^{26,27}

Recent research supports a sensory integration model between joint, muscle and cutaneous receptors.²⁸ This form of combined processing leads to more appropriate responses due to the increased level of redundancy within the system that allows compensation for errors in feedback. The plastic nature of nervous system is one whereby increased input, be it frequency, duration, or strength of activation, as an external stimulus or a motor program leads to either a stronger or weaker response to that input. This is the result of a greater number of synaptic connections being established within the CNS to better handle the variety of stimuli and respond to them appropriately, be it with a positive or detrimental outcome. In essence, the ability of the nervous system to learn is dependent on neural plasticity. Where damage has occurred to articular and/or muscular structures, the altered sensations from their mechanoreceptors can be compensated

through the various neuroplastic adaptive mechanisms that are impaired by the activation of cutaneous afferent receptors through the continuous wearing of the tape. This can lead to improved joint and position sense thus improving sensorimotor control.^{29, 30, 31}

CONCLUSION

It is thus concluded that, combined technique (Y & I) application of kinesiio taping is effective in improving power average, power peak and horizontal distance in collegiate female athletes as compared to Y and I technique application alone.

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