

Original Research Article

Facilitatory Effects of Kinesio Taping on Forearm Extensors in Improving Hand Grip and Pinch Grip Strength

Saravanan Murugan¹, Patel Shruti², Patel Tejal², Prajapati Charul²

¹Associate Professor & Principal In-charge, The Sarvajanic College of Physiotherapy, Badatwadi, Chhada-Ole, Rampura, Surat – 395003, Gujarat, India

²Graduate Physiotherapists, The Sarvajanic College of Physiotherapy, Badatwadi, Chhada-Ole, Rampura, Surat – 395003, Gujarat, India

***Corresponding author**

Saravanan Murugan

Email: saravananmurugan77@gmail.com

Abstract: Kinesio taping methods are widely used in sports and in rehabilitation as a means to improve muscle strength. The present study aims to determine the immediate and delayed, facilitatory effects of kinesio taping on forearm extensors in improving hand grip and pinch grip strength on normal, healthy, female young adults. Forty two female collegiate were randomly selected and were assigned randomly to Kinesio taping and no taping (control) group. Hand grip strength using hand held dynamometer and pinch grip strength using a pinch grip manometer were measured before and immediately after the application of kinesio taping. Measurements were also recorded after 24 hours and 48 hours of application of kinesio tape and results compared with control group. Independent t-test was used to determine the changes between the groups and repeated measures ANOVA for differences within the groups at different time periods ($p < 0.05$). While no significant differences were observed in the improvement of pinch grip strength between the groups, hand grip strength showed improvement in kinesio taping group after 48 hours of application ($p = 0.015$). Significant differences were observed in hand grip ($F = 5.586$, $p = 0.002$) and pinch grip strength ($F = 3.871$, $p = 0.011$) in kinesio taping group when compared for changes within the group at different time periods while control group showed no significant difference. Although kinesio taping improved forearm extensor muscle strength compared to pre-taped condition within group, it is not better than control group in improving hand grip and pinch grip strength.

Keywords: Kinesio tape, Forearm Extensor, Hand Grip strength, Pinch Grip strength, Facilitation, Immediate effects

INTRODUCTION

Kinesio taping (KT) has gained its popularity as an important adjunct method in rehabilitation in the recent years. Introduced by Kenzo Kase, this taping technique utilizes its elastic properties providing less restriction and more mobility. For the treatment of muscles, there are two basic types of applications suggested by Kase – KT applied from origin to insertion to facilitate muscle function and from insertion to origin to inhibit muscle function [1].

Hand grip and Pinch grip strength are considered as an effective, easily obtainable and reliable method to measure forearm muscle function. Grip strength is commonly considered stronger in the dominant hand as compared to the non-dominant hand [2]. This grip strength is affected by age, gender and even position of the different segments of the body. Instruments used and assessors involved in the assessment also affect the outcome of grip strength measures.

Several studies in the past focused on determining the strength improving effects of KT [3-10]. While some studies reported the immediate effects of KT on muscle strength, others reported on delayed effects. Muscles studied also varied from forearm muscles to quadriceps; different types of muscle strength – isometric, eccentric and concentric, after application of KT were also studied. However, studies using pinch grip as an outcome measure after application of taping were less. Despite the results of these studies, there is inconclusive scientific evidence on the muscle strength improving effects of KT, as a result of paucity of consistent results.

The present study was conducted to determine the effects of KT in improving hand grip and pinch grip strength, immediately and at two different time periods after its application. It also aimed at determining the time period of maximum improvement of muscle

strength by measuring it after 24 hours and 48 hours after tape application.

MATERIALS AND METHODS

Forty two healthy female collegiate participated in this study (mean Age 19.79 ± 1.22). All the participants were free from any musculoskeletal disorders in the past 3 months prior to the study. No allergic response to kinesiio tape was reported by the participants. A written informed consent was obtained from the participants before the commencement of the study. Twenty one participants were randomly assigned to either KT group or no taping (control) group. Hand grip and pinch grip strength of dominant hand were measured using SAEHANS dynamometer and manometer respectively. Both the instruments were calibrated and the scores were recorded in kilograms.

Instructions were provided on the usage of dynamometer and manometer with trials to become familiar with the instruments. Participants were seated on a chair with back and arm support in the upright position with feet supported by the floor. Participants were instructed to perform hand grip strength with arms adducted, forearm in mid prone position and wrist in slight extension [11]. They were instructed to grip the handle of the dynamometer set at the second grip, with maximum force possible. Pinch grip strength was also measured using the above mentioned procedure, by holding the manometer between the pulp of thumb and side of the index finger.

Participants repeated the measures thrice with 1 minute rest between measurements and an average of three measurements was taken for analysis. These were recorded as the baseline outcome measures.

A single I strip of kinesiio tape was measured from the lateral epicondyle to the distal interphalangeal joint of the fingers and one end cut into five tails to be taped around the fingers including the thumb. Anchor was applied without any tension at the lateral epicondyle with the elbow in extension, forearm

pronation, wrist and finger in flexion. With 15% to 25% tension through each tail, the tape ends were attached to the distal phalanx of each finger by ending with no tension. The tape was then rubbed along its applied course to activate the adhesion [1].

After application of kinesiio tape immediate measurements of hand grip and pinch grip were taken, followed by second and third measurements after 24 hours and 48 hours respectively. The same procedure of immediate, 24 hours and 48 hours measurement was followed without tape application in the control group.

Independent t test was used to compare the changes in outcome measures between the groups and repeated measures ANOVA was used to analyze the changes in effects within the groups at three different time periods (immediate, 24 hours and 48 hours). SPSS v 20.0 was used and an alpha level of less than 5% ($p \leq 0.05$) was considered statistically significant. All data are presented as means \pm SD.

RESULTS & DISCUSSION

When hand grip and pinch grip strength were compared between KT and control groups, statistically significant differences were observed by means of improvement in hand grip strength in the KT group after 48 hours of application of taping ($t=2.54$, $p=0.015$) (Table-1). No significant differences were observed in pinch grip strength.

Analysis of obtained data using repeated measures ANOVA showed significant differences in both outcome measures at different time periods (Table-2). Post hoc analysis of the outcome measures showed significant differences only in the KT group, with no changes in the control group (Table 3 and 4). Hand grip strength showed improvements after 48 hours when compared with immediately after application ($p=0.000$) and 24 hours after application ($p=0.014$). Pinch grip strength also showed improvements after 48 hours when compared with immediately after application ($p=0.001$) and 24 hours after application ($p=0.007$).

Table 1: Mean comparison of hand grip and pinch grip strength between groups using Independent t test

	KT		Control		t	p
	Mean	SD	Mean	SD		
Pre HG	23.52	3.34	23.39	4.10	.110	.913
HG immed	23.30	3.71	23.30	4.32	.000	1.00
HG 24hr	24.25	3.35	23.26	3.71	.901	.373
HG 48hr	25.36	2.86	22.93	3.30	2.54	.015*
Pre PG	5.14	.811	5.12	1.00	.079	.938
PG immed	4.94	.66	5.26	1.06	-1.15	.254
PG 24hr	5.09	.59	5.18	1.05	-.330	.743
PG 48hr	5.53	.93	5.08	1.01	1.47	.147
KT – Kinesiio taping group HG – Hand Grip PG – Pinch Grip						

Table 2: Tests of within – subject effects using Repeated measures ANOVA for hand grip strength

Source (Time * Grp)	Type III Sum of Squares	Mean Square	F	Sig.
HG	39.378	15.158	5.586	.002
PG	3.207	1.069	3.871	.011
HG – Hand Grip PG – Pinch Grip				

Table 3: Post hoc analysis of hand grip strength at immediate, 24 hours and 48 hours within groups

	(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.
KT	Pre	Imm	.222	.415	.595
		24Hr	-.730	.449	.112
		48Hr	-1.841*	.570	.002
	Imm	Pre	-.222	.415	.595
		24Hr	-.952*	.449	.040
		48Hr	-2.063*	.506	.000
	24Hr	Pre	.730	.449	.112
		Imm	.952*	.449	.040
		48Hr	-1.111*	.433	.014
	48Hr	Pre	1.841*	.570	.002
		Imm	2.063*	.506	.000
		24Hr	1.111*	.433	.014
Control	Pre	Imm	.095	.415	.820
		24Hr	.127	.449	.779
		48Hr	.460	.570	.424
	Imm	Pre	-.095	.415	.820
		24Hr	.032	.449	.944
		48Hr	.365	.506	.475
	24Hr	Pre	-.127	.449	.779
		Imm	-.032	.449	.944
		48Hr	.333	.433	.446
	48Hr	Pre	-.460	.570	.424
		Imm	-.365	.506	.475
		24Hr	-.333	.433	.446

Table 4: Post hoc analysis of pinch grip strength at immediate, 24 hours and 48 hours within groups

ID no.	(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.
KT	Pre	Imm	.205	.144	.164
		24Hr	.054	.179	.765
		48Hr	-.383*	.186	.047
	Imm	Pre	-.205	.144	.164
		24Hr	-.151	.147	.312
		48Hr	-.587*	.156	.001
	24Hr	Pre	-.054	.179	.765
		Imm	.151	.147	.312
		48Hr	-.437*	.155	.007
	48Hr	Pre	.383*	.186	.047
		Imm	.587*	.156	.001
		24Hr	.437*	.155	.007
Control	Pre	Imm	-.135	.144	.356
		24Hr	-.056	.179	.758
		48Hr	.040	.186	.832
	Imm	Pre	.135	.144	.356
		24Hr	.079	.147	.593
		48Hr	.175	.156	.271
	24Hr	Pre	.056	.179	.758
		Imm	-.079	.147	.593
		48Hr	.095	.155	.542
	48Hr	Pre	-.040	.186	.832
		Imm	-.175	.156	.271
		24Hr	-.095	.155	.542

Various researchers studied the facilitating effects of kinesio taping on different muscles. While taping effects on Quadriceps muscle had been studied extensively [3, 6, 12-16] there were a few studies on forearm muscles [4, 17] scapular muscles [18] and trunk muscles [19]. Some studies involved determining the immediate effects of taping while others focused on delayed effects up to 72 hours [3, 6, 13].

Venta *et al* [17] used maximal hand grip and pinch grip strength as outcome measures to study the effects of kinesio tape application on forearm muscles. They recorded the outcome measures 30 minutes and 1 hour after tape application in healthy non athletic subjects. They found an increase in maximal key pinch force after 1 hour and increase in maximal grip strength after 30 minutes and 1 hour of tape application, however no difference was observed between the experimental and control groups.

Our results were similar to Venta *et al* [17] where no difference was observed in hand grip and pinch grip between the two groups except for changes in hand grip strength after 48 hours of tape application.

Results from study by Chang *et al* [4] also showed no differences in hand grip strength when compared between taping, without taping and placebo taping conditions in healthy collegiate athletes, in line with the results of the present study.

However, results of the present study were in contrast to studies by Kuo *et al* [20], Mohammadi *et al* [10] and Thiago *et al* [21] who observed positive effects of kinesio taping on hand grip strength. Kuo *et al* [20] used facilitation and inhibition techniques of kinesio taping on maximal isometric strength of wrist and finger muscles. They concluded that the applied direction of taping may have different effects on isometric hand grip strength. However this study did not have a comparative group or control group which limits and weakens the conclusion claimed by the researchers.

Mohammadi *et al* [10] aimed to identify the best region of forearm taping, effect timing on forearm muscles by measuring hand grip strength. They found extensor taping more effective than flexor taping and recommended kinesio taping to improve hand grip strength. They also concluded that the effect duration of taping effectiveness to be 1.5 hours.

Thiago *et al* [21] in their study observed the effects of kinesio taping on hand grip strength in left and right hand after 30 minutes, 24 hours and 48 hours of application. They found significant differences after 24 hours and 48 hours in both hands. They concluded that kinesio taping is effective in increasing hand grip strength when applied with systematic standards. Despite the positive claims by the above studies, the

clinical efficacy of kinesio taping based on the percentage changes observed in the results, its possible mechanism and clinical significance still remains inconclusive.

CONCLUSION

Based on the results obtained from our study and the above discussion, it can be concluded that kinesio taping does not have a better lead in improving hand grip and pinch grip strength than control group. Although improvements in both hand grip and pinch grip strength were observed in the kinesio taping group after 48 hours of tape application, the clinical significance of the same is questionable.

REFERENCES

1. Kase K WJ, Kase T; Clinical Therapeutic Applications of the Kinesio Taping Method. 3rd ed. Tokyo: Kinesio Taping Assoc., 2003.
2. Incel NA, Ceceli E, Durukan PB, Erdem HR, Yorgancioglu ZR; Grip strength: effect of hand dominance. Singapore medical journal, 2002; 43(5):234-7.
3. Fu TC, Wong AM, Pei YC, Wu KP, Chou SW, Lin YC; Effect of Kinesio taping on muscle strength in athletes-a pilot study. Journal of science and medicine in sport / Sports Medicine Australia, 2008; 11(2):198-201.
4. Chang HY, Chou KY, Lin JJ, Lin CF, Wang CH; Immediate effect of forearm Kinesio taping on maximal grip strength and force sense in healthy collegiate athletes. Physical therapy in sport : official journal of the Association of Chartered Physiotherapists in Sports Medicine, 2010; 11(4):122-7.
5. Espejo LAM; Bibliographic review of the effectiveness of kinesio taping. Rehabilitación, 2011; 45(2):148-58.
6. Vithoulka I BA, Malliou P, Aggelousis N, Karatsolis K, Diamantopoulos K; The effects of Kinesio-Taping® on quadriceps strength during isokinetic exercise in healthy non athlete women. Isokinet Exerci Sci., 2010; 18(1):1-6.
7. Rodriguez-Moya A G-SM, Cuesta-Vargas AI; Short-term effects of neuromuscular tape on knee extension force. Fisioterapia, 2011; 33(6):256-61.
8. Wong OM, Cheung RT, Li RC; Isokinetic knee function in healthy subjects with and without Kinesio taping. Physical therapy in sport: official journal of the Association of Chartered Physiotherapists in Sports Medicine, 2012; 13(4):255-8.
9. Rafael Merino-Marban DM-V, Rodríguez EF; Acute and 48 h effect of kinesiotaping on the handgrip strength among university students. Journal of Human Sport & Exercise, 2012; 7(4):741-7.
10. Hosein Kouhzad Mohammadi KKK, Naeimi SS, Pourezad M, Shokri E, Tafazoli M, Dastjerdi M, Kardooni L; Immediate and Delayed Effects of

- Forearm Kinesio Taping on Grip Strength. Iran Red Crescent Med J., 2014; 16(8):1-5.
11. Fess E, Moran C; Clinical assessment recommendations. 2nd ed. Philadelphia: American Society of Hand Therapists; 1981.
 12. Osterhues DJ; The use of Kinesio taping in the management of traumatic patella dislocation. A case study. Physiotherapy theory and practice, 2004; 20:267-70.
 13. Slupik A, Dwornik M, Bialoszewski D, Zych E; Effect of Kinesio Taping on bioelectrical activity of vastus medialis muscle. Preliminary report. Ortopedia, traumatologia, rehabilitacja, 2007; 9(6):644-51.
 14. Chen WCHW, Huang T; Effects of kinesio taping on the timing and ratio of vastus medialis obliquus and vastus lateralis muscle for person with patellofemoral pain. Journal of biomechanics, 2007; 33:310-8.
 15. Murray H; Kinesio taping, muscle strength and ROM after ACL repair. J Orthop Sports Phys Ther., 2000; 30(1):A-14.
 16. Vercelli S, Sartorio F, Foti C, Colletto L, Virton D, Ronconi G; Immediate effects of kinesiotaping on quadriceps muscle strength: a single-blind, placebo-controlled crossover trial. Clinical journal of sport medicine : official journal of the Canadian Academy of Sport Medicine, 2012; 22(4):319-26.
 17. Venta Donec LV, Krisciunas A; The effect of Kinesio Taping on maximal grip force and key pinch force. Polish annals of Medicine, 2012; 19:98-105.
 18. Hsu YH, Chen WY, Lin HC, Wang WT, Shih YF; The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. Journal of electromyography and kinesiology: official journal of the International Society of Electrophysiological Kinesiology, 2009; 19(6):1092-9.
 19. Yoshida A, Kahanov L; The effect of kinesio taping on lower trunk range of motions. Research in sports medicine, 2007; 15(2):103-12.
 20. Yi-Liang Kuo Y-CH; Effects of the Application Direction of Kinesio Taping on Isometric Muscle Strength of the Wrist and Fingers of Healthy Adults — A Pilot Study. J Phys Ther Sci., 2013; 25:287-91.
 21. Thiago Vilela Lemos KCP, Protássio CC, Lucas LB, Matheus JPC; The effect of Kinesio Taping on handgrip strength. J Phys Ther Sci., 2015; 27(3):567-70.