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Effectiveness of Kinesio taping on ball release speed in district level young male cricket pace bowlers

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Abstract
Background: Cricket pace bowling is an art which requires rhythmic coordinated body movement which can deliver a ball with maximum velocity. Kinesio taping (KT) is a new taping technique increasingly used in sports medicine to improve muscle performance; however, its real effect is not entirely known in cricket world. Also, the effect of mechanical taping on ball release speed is yet to find out. The purpose of the study is to find out effectiveness of faciliatory and inhibitory taping on ball release speed.
Method: In this comparative study, 80 subjects were selected by convenience sampling method based on inclusion and exclusion criteria from Modern College of Physiotherapy, MUHS. The pre and post speed were measured with speed gun. Paired 't' test and One-Way Repeat ANOVA were used for data analysis.
Results: There was a significant difference ($p< 0.05$) between Flexor facilitatory (9.755± 2.408) and Flexor inhibitory (3.099±0.7738) taping. Facilitatory taping technique is showing increase in ball release speed whereas inhibitory taping showed decrease in ball release speed.
Conclusion: According to the results the Facilitatory taping technique is showing significant increase in ball release speed than inhibitory taping technique. For improvement in ball release speed; taping to flexor synergistic group is more beneficial than extensor synergistic group.

Keywords: cricket, pace bowling, Kinesio taping, ball release speed, facilitatory, inhibitory

Introduction
Cricket is one of the oldest organized and the world's second most popular sport, played in many countries worldwide [1]. Bowling is defined as to deliver a 156-g cricket ball towards a batsman or his wicket. The bowlers initiate bowling with a smooth and rhythmical run-up to generate linear momentum, which is transferred from lower extremities to the upper body over the front leg during; the delivery stride [2]. Hand acceleration is produced by the proximal-to distal sequence of joint rotations that is then generated by sequential proximal-to-distal muscle contraction. [3] Biomechanically medium fast bowling can be analyzed as an action where internal shoulder rotator muscles concentrically contract during the acceleration phase counterbalanced by eccentric contraction of the external rotators during the deceleration phase [4]. Cricket Pace Bowling is divided into the following seven phases (1) run-up to the crease while holding the ball, (2) leap into the pre-delivery stride, (3) mid-bound, (4) back foot contact, (5) front foot contact, (6) ball release and (7) follow through [5]. A typical medium fast bowl requires the arm to be rotated at an angular velocity of 60000°s-¹ placing great demands on the shoulder's integrity [6]. The medium faster arm action places more stress on the shoulder joint, predisposing these bowlers to shoulder injuries. The upper extremities account for 25% and 22% of injuries in schoolboy and provincial cricket players, respectively [7, 8]. However, medium fast bowlers have a high incidence of shoulder injuries, with medium fast bowlers sustaining 41% of the upper extremity injuries to cricketers [9]. The muscle imbalance or dysfunction where the eccentrically contracting external rotators are not strong to balance the concentric contraction against the internal rotators are the most common predisposing factor for shoulder injuries in cricket medium fast bowlers [10]. Within fast bowling, participants with higher ball release speeds have been shown to possess a greater anterior-posterior chest depth, a lean upper body and large arm girths [11, 12, 13, 14]. The bowling action involves humerus circumduction, utilising the pectorals major and latissimus dorsi and the deltoid muscles. The biceps brachii are active during the bowling action stabilising the elbow and glenohumeral joint, along with the rotator cuff muscles especially subscapularis and infraspinatius. Force production from the upper body is one aspect of bowling technique and could account for between 36 – 45% of variance in bowling speed [11, 12, 14]. Law of 15° angle angulation of elbow and initiation of shoulder extension shows greater eccentric muscle work on triceps brachii. [16] Increased muscularity of the upper body in performers stems from conditioning programmes and adaptation to the game demands. Bowling conditioning coaches should educate and raise awareness in players of the importance of the role of lean muscle tissue in relevant musculature to help generate higher and more consistent bowling speeds [17, 12]. In recent years, the use of a new form of cotton tape with acrylic adhesive, known as kinesio tape (KT), has proliferated. This tape differs from traditional tape due to it is elasticity—it can be stretched to up to 120% to 140% of its original length before being applied to

the skin.[18] Another difference from traditional tape is that KT can provide a pulling force to the skin and supposedly increase the distance between the fascia and the soft tissue under the areas where it is applied [19, 20]. In addition, KT does not restrict joint movement can be worn for longer periods of time without the need for reapplication [21, 22]. It is also argued that KT can be used not only to increase muscle performance [23] but also to normalize muscle function, to increase lymphatic and vascular flow, to diminish pain, and to aid in the correction of possible articular mal-alignments [21, 24]. While KT techniques are frequently applied to patients with musculoskeletal system disorders, especially in the field of sports injuries [25]. most of the supposed effects are hypothesized, and there is no evidence in the literature supporting the effects of KT taping. The real effects of KT on muscle performance are still being investigated; several authors have hypothesized that the KT facilitates immediate increases in muscle strength by producing a concentric pull on the fascia, which may then stimulate increased muscle contraction, or that KT improves muscle alignment, which may contribute to marginal increases in muscle strength. Slupik*et al* demonstrated an increase in peak torque (24 h) and electromyographic activity (72 h) in the vastus medialis of healthy individuals after application of KT tape [26, 27]. In contrast, Fu *et al* demonstrated that concentric and eccentric muscle strength of the quadriceps and hamstrings were not affected by KT in healthy people [19]. Similarly, Chang *et al* evaluated the effects of KT on maximal grip strength of the dominant hand in healthy college athletes and did not find any significant effect [19]. It seems that KT in cricket players is being used without knowing its real effects on muscle performance. Specifically, studies could not be retrieved that can suggest which type of Kinesio taping will beneficial for improve speed in sports.

Materials and Methods

The testing material is: Bushnell® speed Radar Gun.

Specification

- Speed performance: 10-110 MPH for ball up to 90 feet
- Accuracy: +/- 1 MPH

Study Design and Setting

Comparative Study Was conducted at cricket academies in Mumbai and Pune. Population was screened for the inclusion criteria. Players who met the following criteria were included

1. District level young male cricket bowler (experience 2-5 years).
2. Bowler who delivers min at an avg. of 96- 105 km/h per week.
3. Bowler delivers 123-188 deliveries per week.
4. BMI (20-24.9 kg/m^2 = normal).
5. Average height of 5.7 feet and above.
6. Age – 19-25 years.
7. Bowlers training pre-dominantly bowling muscles in practice session.

Procedure

The study was conducted after ethical clearance was obtained from the Progressive Education Society's Modern College of Physiotherapy. The cricket pace bowlers were explained about the purpose of the study. An informed consent was taken from the players who are willing to participate in the study. The subjects were screened for inclusion and exclusion criteria by the primary investigator and then the baseline measurements were taken. Eligible subjects (80) were allocated into four groups. The groups are:

Group A: Subjects receiving Facilitatory taping technique to Flexor synergistic muscle group.

Group B: Subjects receiving Facilitatory taping technique to Extensor synergistic muscle group.

Group C: Subjects receiving Inhibitory taping technique to Flexor synergistic muscle group.

Group D: Subjects receiving Inhibitory taping technique to Extensor synergistic muscle group.

Table 1: Muscles included in flexor and extensor group [28]

	Flexor Synergistic Muscle Group (Fig 2)	Extensor Synergistic Muscle Group (Fig 1)
1	Deltoid(Y-strip)	Deltoid(Y-strip)
2	Biceps Brachii(Y-strip)	Triceps Brachii(Y-strip)
3	Subscapularis(Y-strip)	Infra Spinatus(Y-strip)
4	Pectoralis Major(Y-strip)	Latissimus Dorsi(I-strip)

A total of 20 subjects in each group were included in the study.

Taping procedure for Group A and B

Facilitatory Taping Technique: ORIGIN to INSERTION application tension is light to moderate, 25-50% of available tension. When applying the Kinesio Tape with proper application technique for ORIGIN to INSERTION, the practitioner should be able to see slight separation of the elastic fibers in the Kinesio Tape [20].

Taping procedure for group c and d

Inhibitory Taping Technique: INSERTION to ORIGIN application tape stretch/ tension is very light or light, 15-25% of available tension. Using the preferred Kinesio Tape, this would simply require applying the tape by placing it on the muscle as it comes off of the paper backing (paper off tension) [20].

Application of muscle tape

Kinesio strip types used

Y strip application: With the skin properly prepared, base applied with no tension, and muscle/tissue on a stretch. Surround the muscle to be taped by laying down one of the two tails of the "Y" strip. Tension is applied evenly along the tail. As the tape is being laid down, follow behind with a thumb or finger and rub the tape onto the skin to initiate glue adhesion. When the tail of the tape is approximately one to two inches from the end, stop tension and lay the end down with no tension. Again, rub the applied tape strip to initiate glue adhesion prior to moving the muscle from its current stretched position. Where appropriate, place the muscle in a second stretched position to apply the second tail of the "Y" strip. Follow the above description for the second tail. (20)

I strip application: Application of the 'I' technique follows the same basic principles as the Y technique. Instead of surrounding the muscle belly, the Kinesio strip is applied directly over the area of injury or pain. (20)

Positions for apply Kinesio Tape

1. Position for Deltoid: Place the shoulder in abduction to 90%, external rotation and horizontal extension. Apply the anterior tail along the outer border of the anterior deltoid to approximately the AC joint. Move the shoulder into horizontal flexion with internal rotation while maintaining abduction. Apply the posterior tail along the outer border of the posterior deltoid to approximately the AC joint. [20]
2. Position for Subscapularis: Have the patient move into shoulder abduction with horizontal flexion and internal rotation. The superior tail should follow along the inferior border of the spinous process, aiming for the superior tip of the scapula. The inferior tail should follow along the inferior border of the scapula, aiming for the inferior tip. [20]
3. Position for Biceps Brachii: Begin by placing below the biceps tuberosity on the radial head, or superior to the anterior cubital space on the humerus. Have the patient move into shoulder abduction, extension, and external rotation. The lateral tail should follow the outside edge of the long head of the biceps to the supraglenoid tuberosity of the scapula. The medial tail should follow along the short head of the biceps to the coracoid process of the scapula. [20]
4. Position for Pectoralis Major: Have the patient move into flexion, abduction and external rotation of the shoulder. Place the upper tail along the superior aspect of the muscle to the junction of the third sternocostal joint. Place the lower tail along the inferior aspect of the muscleto the fifth sternocostal joint [29].
5. Position for Triceps Brachii: Have a patient in sitting position. Flexion of elbow and flexion of shoulder joint making elongation of triceps brachii. The lateral tail should follow the outside edge of the long head of the triceps to the infraglenoid tuberosity of the scapula. The medial tail should follow along the medial border of axilla of the tricpes to the infraglenoid tuberosity of the scapula. [20]
6. Position for Infraspinatus: Have a patient in sitting position. Shoulder is horizontally adducted and internally rotated. Touch the palm to the to the opposite shoulder joint. [20]
7. Position for Latissimus dorsi: Have a patient is standing position. Flexes the lumbar spine with opposite side flexion. Shoulder is abducted to 90º with horizontal adduction and internally rotated [30].

Table 2: Surface landmarks for applying Kinesio tape [28]

	Surface Landmarks	
	Origin	**Insertion**
Deltoid	Acromio-Clavicular Joint Spine of Scapula Lateral 1/3 of clavicle	Deltoid Tuberosity
Subscapularis	inferior border of the spinous process inferior border of the scapula	Lesser tubercle of the humerus
Biceps Brachii	Supraglenoid tubercle Tip of Coracoid process of the scapula	radial tuberosity on the radius
Pectoralis Major	Ant. 2/3 of clavicle 2^{nd} – 6^{th} costal cartilages	Lateral lip of bicipital groove
Infra spinatus	Inferior border of spinous processAbove the inferior angle of scapula	Greater tuberosity of the humerus
Triceps Brachii	Infraglenoid tuberosity Along the posterior surface of humerus	Olecranon process of the ulna
Latissimus Dorsi	Spinous process of T7-T12 Posterior lumbar fascia Posterior 1/3 of outer lip of iliac crest	Floor of intertubercular sulcus

After application of tape bowler bowled 4 overs spell to get average speed of bowler. Re-application of tape done after 3 days for two weeks. At the end of the treatment session tape was removed and again 4 overs spell bowled by bowler to get post taping average speed. Speed was measured standing at non-striker's end keeping speed gun above the stumps.

Fig 1: Taping to extensor Synergistic group

Fig 2: Taping to flexor Synergistic group

Result

After analysis of the data our study signifies that group A, B and C receiving muscle taping showed significant change in ball release speed except Group D. p value <0.01 i.e. all groups having significantly different data. (table 4). Extensor inhibitory (Group D) failed to show any increase or decrease in ball release speed p value >0.05. (table 4) Group D data

shows no significant result with the p-value of 0.1743. Facilitatory taping to flexor and extensor synergistic muscle showed increase in ball release speed whereas inhibitory taping to flexor and extensor synergistic muscle showed decrease in ball release speed (table 5 and 6a & 6b). Table 5 shows Group A, B, C and D pre-post mean differences, compared with One Way Repeat ANOVA. The result obtained from this is extremely significant with the p-value<0.0001. Table 6a shows Facilitatory versus inhibitory mean difference data, compared with One Way Repeat ANOVA. Here Facilitatory taping technique is showing increase in ball release speed whereas inhibitory taping showed decrease in ball release speed. Table 6b is showing flexor versus extensor Facilitatory and flexor versus extensor inhibitory mean difference data compared with One Way Repeat ANOVA. It shows extremely significant result with p-vale<0.0001. Hence, according to the results the Facilitatory taping technique is showing significant increase in ball release speed than inhibitory taping technique.

Pre data was analyzed by one way repeat ANOVA to see that all groups were having same pre taping ball release speed.

Table 3: Group A, B, C and D pre-data are compared with One Way Repeat ANOVA.

Group	Mean ± SD	t value	p value	Result
A	101.81 ± 2.789	0.2786	>0.05	Not Significant
B	100.98 ± 2.491			
C	101.18 ± 2.753			
D	101.31 ± 3.733			

Pre and post data of Group A B C and D were measured by paired t-test to see whether there was any significant difference in ball release speed.

Table 4: Group A, B, C and D pre and post data are compared with paired t-tes

Group	Mean pre ± SD	Mean post ± SD	t value	p value	Resul
A	101.81 ± 2.789	111.5605 ± 3.901	18.117	<0.0001	Extremely Significant
B	100.98 ± 2.491	104.0785 ± 2.541	17.909	<0.0001	Extremely Significant
C	101.18 ± 2.753	99.695 ± 2.733	6.388	<0.0001	Extremely Significant
D	101.31 ± 3.733	100.879 ± 3.271	1.411	0.1743	Not significant

Post taping data were analyzed by one way repeat ANOVA to see that all groups were having difference in post taping ball release speed.

Table 5: Group A, B, C and D pre-post mean difference are compared with One Way Repeat ANOVA

Group	Mean DIF. ± SD	p Value	t value	Result
A	9.755 ± 2.408	<0.0001	23.213	Extremely Significant
B	3.099 ± 0.7738		21.042	
C	-1.4865 ± 1.041		13.744	
D	-0.435 ± 1.378		9.469	

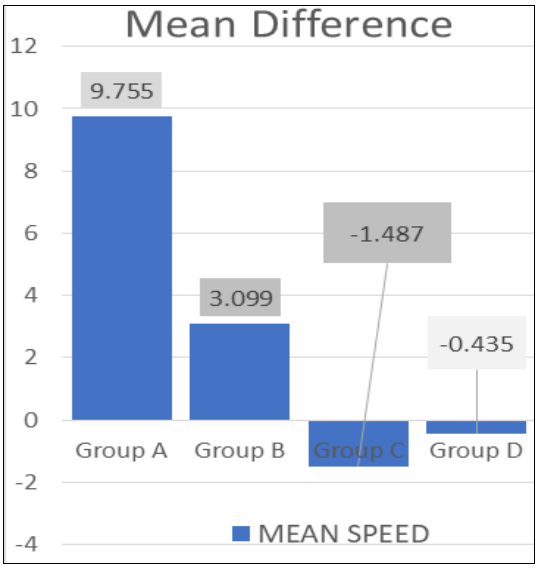

Fig 3: Post-Taping mean speed difference of 4 groups compared with pre- taping speed.

Comparison between facilitatory versus inhibitory done with one way repeat ANOVA

Table 6a: Facilitatory versus inhibitory mean difference data are compared with One Way Repeat ANOVA

	Group A	Group B	Group C	Group D
Facilitatory	9.755	3.099		
Inhibitory			-1.4865	-0.435

Table 6b: Flexor & extensor facilitatory and inhibitory mean difference data are compared with One Way Repeat ANOVA

Group	Mean Dif. ± SD	P Value	T value	Result
Flexor vs Extensor facilitatory	6.656 ± 1.041	<0.0001	13.744	Extremely Significant
Flexor vs Extensor inhibitory	-1.052 ±0.7738		2.171	

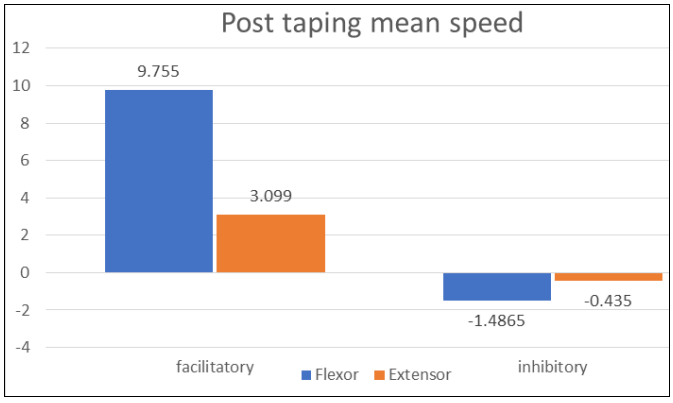

Fig 4: Post-Taping mean speed of facilitatory and inhibitory taping technique.

Discussion

The aim of our study was to compare between facilitatory and inhibitory kinesio taping techniques in individuals with cricket pace bowlers. Our findings suggested a significant improvement in ball release speed of players with facilitatory taping technique whereas decrease in ball release speed in flexor inhibitory group (table 4). Our data did not show any significant difference in inhibitory taping technique to extensor synergistic group. These findings agree with the notion proposed by Lee *et al* showed greater grip strength after applying KT to the flexor muscles than that of the untaped muscles [31]. Huang *et al* investigated the effect of elastic taping on the triceps surae during a maximal vertical jump. They observed that vertical ground-reaction force and electromyographic activity of the gastrocnemius medialis increased when KT was applied, although the height of jump remained constant [32]. Hsu *et al* observed an incremental increase in lower trapezius muscle strength after a taping application [26]. Also for inhibitory kinesio taping to flexor synergistic group Elizabeth *et al*. shown decrease in EMG activity on gastrocnemius after application of inhibitory taping which justify our findings of inhibitory taping [33]. Our finding failed to support Fu *et al* demonstrated that concentric and eccentric muscle strength of the quadriceps and hamstrings were not affected by KT in healthy people. Similarly, Chang *et al* evaluated the effects of KT on maximal grip strength of the dominant hand in healthy college athletes and did not find any significant effect [18, 27] There was decrease in ball release speed in extensor inhibitory group but statistically not significant; reason being this group involved 2 most activated muscles of bowling action 1) Infraspinatus 2) Latissimus Dorsi. According to Katheleen S. *et al* Infraspinatus is the most activated muscles from phase Front Foot Contact to Ball Release along with Triceps Brachii [34] This justify our findings that Kinesio Taping has less influence on extensor synergistic group. More detailed study shown that Kinesio taping helped bowlers to consistently bowl to their maximum speed that helped in improving the average ball release speed in Facilitatory taping group. Whereas bowlers with inhibitory taping group were in- consistent in their performance. This proves the effect of Kinesio taping on the proprioception; also the effect of mechanical taping i.e. facilitatory and inhibitory taping on the muscle actions.

Conclusion

Facilitatory taping to flexor synergistic muscles i.e. Deltoid, Pectoralis Major, Subscapularis and Biceps Brachii gave response to 2 weeks of taping protocol. Facilitatory taping to extensor synergistic muscles i.e. Deltoid, Latissimus Dorsi, Infraspinatus and Triceps Brachii gave response to 2 weeks of taping protocol. Whereas Inhibitory Taping Technique to Flexor synergistic muscles showed decrease in ball release speed. Inhibitory Taping Technique to Extensor synergistic muscles showed no effect on ball release speed. Hence, Muscle Kinesio Taping Technique affects the Ball release speed in district level young male pace bowlers. In this study all the 4 groups i.e. Group A, Group B, Group C and Group D showed differences in the pre and post taping ball release speed in district level young male cricket pace bowlers. But on comparing the data of all the groups statistically, the facilitatory taping showed increase in ball release speed in both flexor and extensor synergistic muscle groups i.e. Group A and Group B whereas inhibitory taping showed decrease in ball release speed in both flexor and extensor synergistic muscle groups i.e. Group C and Group D assessed with the Bushnell Speed Gun [35].

Reference

1. Bartlett R. Movement coordination and movement variability. Sports Biomechanics. 2007; 6(2):119-120.
2. Ferdinands R, Kersting U, Marshall R. A new taxonomic system for the sub-classification of cricket bowling actions. Sports Technology, Available. 2014; 6182:37-41 at: http://www.tandfonline.com/doi/abs/10.1080/19346182.893350.
3. Hirashima M. Sequential muscle activity and its role in the upper extremity and trunk during overarm throwing. Journal of sports sciences. 2002; 20(4):301-310.
4. RF E, JR A. Shoulder muscle recruitment patterns and related biomechanics during upper extremity sports. Sports Medicine. 2009; 39(7):569-590. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=105395182&site=ehost-live.
5. https://en.wikipedia.org/wiki/Bowling_action
6. Donatelli R. Assessment of shoulder strength in professional baseball pitchers. The Journal of Orthopaedic and Sports Physical Therapy, 2000; 30(9):544-551.
7. Stretch RA. The incidence and nature of injuries in schoolboy cricketers. S Afr Med J. 1995; 85:1182-4.
8. Wilk KE, Arrigo C. Current concepts in the rehabilitation of the athletic shoulder. J Orthop Sports Phys Ther. 1993; 18:365.
9. Stretch RA. Injuries to South African cricketers. British journal of sports medicine. 2003; 37:250-254.
10. Aginsky K, Lategan L, Stretch R. Shoulder injuries in provincial male fast bowlers - predisposing factors. South African Journal of Sports Medicine. 2004; 16(1):25-28.
11. Portus M, Sinclair P, Burke S, Moore D, and Farhart P. Cricket fast bowling performance and technique and the influence of selected physical factors during an 8 over spell. Journal of Sports Sciences 18: 999 - 1011, 2000.
12. Pyne D, Duthie G, Saunders P, Petersen C, and Portus M. Anthropometric and strength correlates of fast bowling speed in junior and senior cricketers. Journal of Strength and Conditioning Research 20: 620 - 626, 2006
13. Stretch R, Lambert M. Heart rate response of young cricket fast bowlers while bowling a six-over spell. Sports Medicine. 1999; 6:15-19.
14. Stuelcken M, Pyne D, Sinclair P. Anthropometric characteristics of elite fast bowlers. Journal of Sports Sciences. 2007; 25:1587-1597.
15. Powers SK, Howley ET. Exercise physiology: Theory and application to fitness and performance. New York: McGraw-Hill Intl, 2007.
16. Dr. Animesh Hazari, Mehzabeen Warsi, Dr. Ioannis Agouris. Electromyography analysis of shoulder and wrist muscles in semi-professional cricket fast bowlers during bouncer and yorker delivery. A cross-sectional

comparative study. International Journal ofPhysical Education, Sports and Health. 2016; 3(6):77-87.
17. McArdle WD, Katch FL, Katch VL. Exercise physiology: Nutrition, energy and human performance. Philadelphia, Pen.: Lippincott Williams and Wilkins, 2009.
18. 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. Phys Ther Sport. 2010; 11:122-127. PubMed doi:10.1016/j. ptsp.2010.06.007
19. 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. J Electromyogr Kinesiol. 2009; 19:1092-1099. PubMed doi:10.1016/j.jelekin.2008.11.003
20. Kase K, Wallis J, Kase T. Clinical Therapeutic Applications of the Kinesio Taping Method. Tokyo, Japan: Ken Ikai Co. Ltd, 2003.
21. Kase K, Tatsuyuki H, Tomoko O. Development of Kinesio Tape. Kinesio Taping Perfect Manual. Tokyo, Japan: Kinesio Taping Association, 1996.
22. Sijmonsma J. Manual de Taping Neuro Muscular. Cascais, Portugal: Aneid Press, 2007.
23. Firth BL, Dingley P, Davies ER, Lewis JS, Alexander CM. The effect of kinesiotape on function, pain, and motoneuronal excitability in healthy people and people with Achilles tendinopathy. Clin J Sport Med. 2010; 20:416–421. ubMed doi:10.1097/JSM.0b013e3181f479b0
24. Williams S, Whatman C, Hume PA, Sheerin K. Kinesio taping in treatment and prevention of sports injuries: a meta-analysis of the evidence for its effectiveness. Sports Med. 2012; 42:153-164. PubMed doi:10.2165/11594960000000000-00000
25. Yasukawa A, Patel P, Sisung C. Pilot study: investigating the effects of kinesio taping in an acute paediatric rehabilitation setting. Am J Occup Ther. 2006; 60:104-110. PubMed doi:10.5014/ajot.60.1.104
26. Hammer WI. Functional Soft-Tissue Examination and Treatment by Manual Methods. 3rd ed. Boston, MA: Jones & Bartlett, 2006.
27. Fu TC, Wong A, Pei YC, Wu KP, Chou SW, Lin YC. Effect of kinesio taping on muscle strength in athletes—a pilot study. J Sci Med Sport. 2008; 11:198-201. PubMed doi:10.1016/j.jsams.2007.02.011
28. Drake, Richard Vogl A. Wayne; Mitchell, Adam W. M. Gray's Anatomy for Students E-Book London: Churchill Livingstone, 2009.
29. Position for Pectoralis Major https://www.youtube.com/watch?v=B2Z13f5dViE
30. Position for Latissimus Dorsi https://www.youtube.com/watch?v=jZCY51bLTpU)
31. Lee JH, Yoo WG, Lee KS. Effects of head-neck rotation and kinesio taping of the flexor muscles on dominanthand grip strength. J Phys Ther Sci. 2010; 22:285-289. doi:10.1589/jpts.22.28
32. Huang CY, Hsieh TH, Lu SC, Su FC. Effect of the kinesio tape to muscle activity and vertical jump performance in healthy inactive people. Biomed Eng Online. 2011; 10:70. PubMed doi:10.1186/1475-925X-10-70
33. Elizabeth A. Davison1, Christopher T. Anderson1, Blake H. Ponist1, Drew M. Werner *et al*. Inhibitory Effect of the Kinesio Taping® Method on the Gastrocnemius Muscle American Journal of Sports Science and Medicine Available online at, 2016; 4(2):33-38 http://pubs.sciepub.com/ajssm/4/2/2 © Science and Education Publishing DOI:10.12691/ajssm-4-2-2
34. Katheleen S, Neal S, Mike L, Paul K. A Preliminary electromyographic investigation into shoulder muscle activity in cricket seam bowling https://ojs.ub.uni-konstanz.de/cpa/article/viewfile/4536/4223
35. Senem G, Serap A, MItat K. Effect of two different kinesio taping techniques on knee kinematics and kinetics in young female J. Phys. Sci, 2015; 27:3093-3096.