

**EFFICACY OF KINESIOTAPING IN LOWER  
TRUNK FLEXION RANGE OF MOTION IN  
TENNIS PLAYERS**

**Dissertation**

Submitted to

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in partial fulfillment for the degree of

**MASTER OF PHYSIOTHERAPY**

**(SPORTS PHYSIOTHERAPY)**



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COIMBATORE, Tamilnadu, India

**May 2018**

## **CERTIFICATE**

The work embodied in the thesis entitled **EFFICACY OF KINESIOTAPING IN LOWERTRUNK FLEXION RANGE OF MOTION IN TENNIS PLAYERS** submitted to the **Tamilnadu Dr. MGR Medical University , Chennai** in the partial fulfillment for the degree of **Master of physiotherapy (sports physiotherapy)** was carried out by candidate bearing register no 271650122 at Cherran's college of physiotherapy Coimbatore under my supervision. This is an original work done by him and has not been submitted in part or full for any other degree/diploma at this or any other university/ institution. The thesis is fit to be considered for evaluation for award of the degree of master of physiotherapy.

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## DECLARATION

I hereby declare and present my project work entitled **EFFICACY OF KINESIOTAPING IN LOWER TRUNK FLEXION RANGE OF MOTION IN TENNISPLAYERS**. The outcome of original research work undertaken and carried out by me, under the guidance of **Professor Chinnachamy MPT, (Sports)**, Cherran's College of Physiotherapy, Coimbatore. I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R. Medical University, Chennai 32.

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## CONTENTS

S.NO.	TOPIC	PAGE NO.
1.	INTRODUCTION	1
2.	REVIEW OF LITERATURE	6
3.	METHODOLOGY	11
	➤ AIM	
	➤ OBJECTIVE	
	➤ STUDY DESIGN	
	➤ SAMPLING	
	➤ TOOLS USED	
	➤ HYPOTHESIS	
	➤ PROCEDURE	
	➤ OUTCOME MEASURES	
	➤ PHOTOGRAPHS	
4.	DATA ANALYSIS & RESULTS	20
5.	DISCUSSION	30
6.	CONCLUSION	34
	REFERENCE	35
	APPENDICES	
	➤ CONSENT FORM	39
	➤ ASSESSMENT FORM	40

## **LIST OF TABLES**

<b>S.NO.</b>	<b>TABLES</b>	<b>PAGE</b>
Table.4.1	Statistical analysis of low back flexion ROM pre and post without kinesiotape v/s pre and post with kinesiotape.	22
Table.4.2	Statistical analysis of low back flexion ROM day 1 before match without kinesiotape v/s day 2 before match without kinesiotape.	24
Table.4.3	Statistical analysis of low back flexion ROM Without kinesiotaping before match day2 v/s With kinesiotaping before match day 2.	26
Table.4.4	Statistical analysis of low back flexion ROM without kinesiotaping after match day 1 v/s with kinesiotaping after match day 2.	28

## LIST OF FIGURES

<b>S.NO</b>	<b>FIGURES</b>	<b>PAGE</b>
Fig. 3.1	Flexion measurement.	14
Fig. 3.2	Y- shapekinesio taping for lower trunk.	16
Fig. 3.3	Low back KINESIOTAPING in stretch position.	17
Fig 3.4	Low back KINESIOTAPING in relax position.	18
Fig.3.5	Material used.	19
Fig. 4.1	Graphical representation of low back flexion ROM pre and post without kinesiotape v/s pre and post with kinesiotape.	23
Fig 4.2	Graphical representation of low back flexion ROM day 1 before match without kinesiotape v/s day 2 before match without kinesiotape.	25
Fig 4.3	Graphical representation of low back flexion ROM Without kinesiotaping before match day2 v/s With kinesiotaping before match day 2.	27
Fig 4.4	Graphical representation of low back flexion ROM without kinesiotaping after match day 1 v/s with kinesiotaping after match day 2.	29

## **LIST OF ABBREVIATIONS**

❖ **KT& K Tape:-** Kinesio Tape

❖ **ROM:-** Range of Motion



## **LIST OF APPENDICS**

<b>APPENDIX I</b>	<b>Consent Form</b>
<b>APPENDIX II</b>	<b>Patient assessment chart</b>

# CHAPTER I

## INTRODUCTION

Overuse or repetitive microtrauma to muscles, joints, ligaments and bones are common injuries seen in athletics. In athletes, low back strength is an important component of participating in many sports, including racquets sports, judo, weight lifting, baseball, martial arts and rock climbing.

In Electromyographic (EMG) studies, performed on collegiate and professional tennis players, it was discovered that the back extensors, lumbar erector spinae, multifidus and DL fascia showed marked activity during portions of the serves, forehand and backhand strokes.<sup>10,18</sup> Therefore, a marked increase in activation of the lumbar muscles may lead to overuse injury resulting in reduced muscle strength or fatigue of low back muscles which may result in the muscle not being able to maintain force output and may also be a contributing factor in decreasing the range of motion of lumbar spine. This would result in decreasing the overall effectiveness of an athlete's sports ability.<sup>12,27</sup>

Previous studies found that neuromuscular control and accuracy of proprioception was affected following muscle fatigue or decreasing muscle strength. Therefore, as muscle fatigue or muscle force degenerates, it will place the low back muscle at risk of injury.<sup>17</sup>

Repetitive stress on the low back muscles is a common chronic injury occurring in the tennis athlete. Common tennis injuries region and prevalence are <sup>4</sup>:- Back --24% , Shoulder-- 21% , Ankle -- 19% , Knee -- 15% , Elbow -- 12%

As there is a high prevalence of back injuries in tennis game, about 38% of players miss tournaments because of low back problems<sup>5,29,20</sup>, like lumbar strains<sup>8</sup> which is caused by following reasons:-

1) Physical demands of tennis cause musculoskeletal adaptations that are sometimes positive (increased strength) and sometimes negative (decreased joint ROM and reduced muscular flexibility). These repeated demands to produce force by muscle shortening can cause a cycle of microtrauma to the tight muscle, followed by scar formation, followed by more microtrauma with continued use<sup>16</sup>. These adaptations can become maladaptations, reducing joint ROM, changing biomechanical patterns, and decreasing the efficiency of force production, thus increasing the chance of injury to the muscle<sup>3</sup>. Lower back pain and back injuries are common complaints among elite tennis players, and this correlates with poor lower back and hamstring ROM.<sup>3</sup>

## **2) Fatigue and performance**

As tennis players practice and play matches that last hours, fatigue is a major concern. Fatigue has been shown to have a detrimental effect on a player's body mechanics<sup>22</sup>, thereby reducing ball velocity (performance), possibly in a protective mechanism to avoid injury by limiting the large ranges of motion and forces in a compromised biomechanical position.<sup>19,2</sup>

Several treatment regimens are used in clinical practice for maintaining range of motion, but there are only a few studies that support the effects of these interventions in the long term. The use of low back taping with rigid /elastic tape is a common method for treating athletes diagnosed with reduced range of motion.

Elastic tapes are often used as a counter force action to decrease the overloading forces and therefore decrease the amount of tension placed on low back muscles. Though many researchers are sceptical about the use of a non elastic rigid tape because it may restrict other musculature around the low back, causing losses in circulation and range of motion.

Kinesio Tape (KT) is a new and popular taping method proposed by KenzoKase, that claims to:

- 1) Gather fascia to align the tissue in its desired position.
- 2) Lift the skin over areas of inflammation, pain, and oedema.
- 3) Increase stimulation of the mechanoreceptors to either stimulate or limit movement.
- 4) Provide a positional stimulus to the skin, and
- 5) Decrease pressure over the lymphatic channels that provide a path for the removal of exudates.<sup>13</sup>

Unlike conventional athletic tape, KT uses elastic properties to provide less muscular and blood flow restrictions. KT can also limit the amount of irritation to the skin, that is often present with conventional athletic tape, because it is latex free and uses heat activated adhesive to adhere to the skin. It has about the same thickness as the epidermis, to limit the body's sensory stimulus, and can be stretched between 55% and 60% of its resting length longitudinally.<sup>13</sup> Despite its widespread popularity, minimal evidence exists to support the use of KT in the treatment of common musculoskeletal disorders.

The unique property of kinesio tape is to allow it to work in ways that cannot be duplicated by any other form of athletic or therapeutic taping. Following is a simplified of the major mechanisms of action:-

Kinesio Tape works by pulling the upper layers of skin, creating more space between the dermis or skin and the muscle. The space created is believed to relieve pressure on the lymph channels in the area between the muscle and the dermis or skin, creating more space for lymph flow and thus better lymph drainage through an affected area.<sup>25</sup> This space also houses various nerve receptors that send specific information to the brain. When the space between the epidermis and the muscle is compressed, such as during an injury, these nerve receptors are compressed and send information to the brain regarding continuous touch, light touch, cold, pain, pressure, and heat. This information causes the brain to send out certain signals to the body on how to react to particular stimuli. Kinesio Tape alters the information that these receptors send to the brain and causes a less reactive response in the body, allowing the body to work in a more normal manner and removing some of the roadblocks that normally slow down the healing process.<sup>15,24</sup>

Kinesio Tape also is felt to affect deeper tissues in the body. Increased space theoretically allows muscles greater contractility, which in turn pushes more fluid through the muscle, resulting in better muscle performance. The end results are believed to be reduced muscle fatigue, increase in range of motion, and better quality of muscle contraction.<sup>36</sup>

Research has found that kinesio taping improves range of motion<sup>6</sup>, KT increases active range of motion of the lower trunk flexors<sup>30</sup>, KT increase active ROM in calf and hamstring muscles<sup>26,27</sup>, increases muscle bioelectrical activity 24 hours after tape

application in healthy patients<sup>31</sup>, aids in the functional motor skills of the upper extremity in a paediatric population.<sup>35</sup>

On the contrary, research suggests that KT does not improve proprioceptive response at the ankle with measures of reproduction of joint position sense<sup>9</sup>, does not have an implication to decrease shoulder pain intensity or disability over time with patients with rotator cuff tendonitis/ impingement<sup>32</sup>, does not improve active lateral trunk flexion or extension range of motion<sup>13</sup>, and does not improve or worsen muscular performance in the posterior or anterior thigh of a healthy collegiate athlete<sup>34</sup>. However, there are no published randomized clinical trials that evaluate the effect of KT on delaying muscular fatigue in an athletic population during a bout of exercise.

Therefore, the purpose of this study was to determine if the use of KT, in healthy collegiate tennis athletes, is effective in decreasing fatigue by maintaining strength of low back muscles and increases range of motion of lumbar spine.

## CHAPTER II

### REVIEW OF LITERATURE

1. **YOSHIDA A**, etal, (2007), the effect of kinesiotaping in lower trunk range of motion. Res sports med. Concluded that kinesiotaping improve active range of motion in lower trunk flexion.
2. **SALVATSALVAT**, etal,(2010), “A. Immediate effect of kinesiotaping on trunk flexion”. Concluded that, increase in trunk flexion in kinesiotape group.
3. **RAFAEL MERINO MARBAN**, etal (2011),. “The effect of kinesiotaping on calf’s injuries prevention in triathletes during competition. Pilot experience”. concluded that it is possible to recommend kinesiotape for to avoid cramps or contracture during the competition.
4. **MERINO MARBAN R**, (2008) “Influence of gastronemius muscle on the sit and reach test after application of kinesiotape in triathletes. A pilot study.” Concluded that there is increase in flexibility of gastronemious muscle after KT application.
5. **Melissaetal**, (2007) “the effect of kinesiotex tape on muscular strength of Forearm Extensor on collegiate Tennis athletes”, and concluded that, there Is less of decrease of forearm strength in tennis athletes.
6. **Frost M**,etal(1982) Reliability of measuring trunk motions in centimetres. Concluded that forward bending exhibited good single measurement reliability in centimetres.

7. **Halseth T**,etal (2004) The effects of kinesiio taping on proprioception at the ankle. Journal of Sports Science and Medicine 3: 1–7. Concluded that Kinesio tape does not appear to enhance proprioception (in terms of RJPS) in healthy individuals.
8. **Kase K** (1994) Illustrated Kinesio-Taping. 2nd ed. Tokyo, Japan: Ken'i-kai Information.6–9, 73. Concluded that KT application does not seem to be an effective treatment method for both decreasing pain and improving joint position sense for patients with PFPS.
9. **Hashimoto T**, etal (13 March 2005) Changes in the volume of peripheral blood flow by using kinesiio tape. Concluded that applying Kinesio Taping® techniques, an immediate effect is seen since the blood flow has been changed immediately (within 10 min.) after taping.
10. **Murray H** (25 February 2005) “Effects of kinesiio taping on muscle strength after ACL-repair”. And concluded that, Kt enhance muscular contraction when applied on anterior aspect of thigh after ACL repair.
11. **Murray H, Husk L** (2001) “Effect of kinesiio taping on proprioception in the ankle”. Journal of Orthopedic Sports Physical Therapy 31: A-37. And concluded that Kinesio™ tape does not appear to enhance reproduction joint position sense.
12. **Tieh c. fu** et al 31 jan. 2007,” Effect of kinesiio taping on muscle strength in athlete. A pilot study”. Concluded that Kinesio taping on the anterior thigh neither decreased nor increased muscle strength in healthy non-injured young athletes.



13. **P.L. Chen** et al (2008), studied that "Biomechanics effects of kinesio taping for persons with patellofemoral pain syndrome during stair climbing. Concluded that kinesiotaping can reduce pain and improve the ratio of VMO/VL for the mechanism of patellar stability.
14. **Vithoulka** et al, (2010). Studied that "The effect of kinesiotaping on quadriceps strength during isokinetic exercise in healthy non athlete women." Concluded that application of kinesiotape on anterior thigh, in the direction of vastusmedialis, lateralis and rectus femories facia, could increase the eccentric muscle strength, in healthy adults.
15. **Wen-Chi Chen** (2007) studied that, "Effect of kinesiotaping on the timing and ratio of vastusmedialisobliquus and lateralis muscle for person with pattelofemoral pain" and concluded that, kinesiotaping would change in timing of VMO and improve the ratio of VMO/VL for the mechanism of efficacy.
16. **Javier Gonzalez-iglesias** et al, (2009). Studied about, "short-term effects of cervical kinesiotaping on pain and cervical range of motion in patent with acute whiplash injury: a randomized clinical trial". Concluded that, by kinesiotape there is improvement in pain and cervical ROM were small and may not be clinically meaningful.
17. **Cheol Hwan Kim** (2002), studied about, "Effect of kinesiotaping in patent with low back pain", concluded that kinesiotaping was more efficacious than placebo in patent with nonspecific low back pain.

18. **Erkan Kaya** et al. (2010). studied that, “kinesiotaping compared to physical therapy modalities for the treatment of shoulder impingement syndrome”.  
Concluded that kinesio tape has been found to be more effective than the local modalities, it may be an alternative treatment option in the treatment of shoulder impingement syndrome especially when an immediate effect is needed.
19. **Francisco Garcia-Muro** et al. (2009). Studied that “treatment of myofascial pain in the shoulder with kinesiotaping”. A case report. Concluded that KT is effective in reducing myofascial pain.
20. **V Bayrakçı Tunay** et al. (2008) studied about “Comparison of the instant effect of Kinesio and McConnell patellar taping on performance in patellofemoral pain syndrome” and concluded that Although positive effect of kinesiotaping on performance in healthy subjects was seen.
21. **Marc Det.**, al. (2008), “The clinical efficacy of kinesio tape for Shoulder pain: A randomized double blind, clinical trial” and concluded that KT may be of some assistance to clinicians in improving pain-free active ROM immediately after tape application for patients with shoulder pain. Utilization of KT for decreasing pain intensity or disability for young patients with suspected shoulder tendonitis/impingement is not supported.
22. **Kase K, Hashimoto T, Okane T** (1996). Kinesio taping perfect manual: Amazing taping therapy to eliminate pain and muscle disorders. Albuquerque, NM: KMS, LLC
23. **Jaime P. Cepeda** (2008) studied about “Does kinesiotaping of the Abdominal Muscles improve the Supine to Sit transition in children with Hypotonia?” and concluded that, There is improvement in the transition of supine to sit.

24. **Audrey Yasukawa**, (2006) studied that “Pilot study: Investigating the effect of kinesiotaping in an acute Pediatric Rehabilitation setting” and concluded that, Kinesiotaping may be associated with improvement in upper extremity control and function.
25. **Kase K, Wallis J, Kase T** (2003) *Clinical Therapeutic Applications of the Kinesio Taping Method*. Tokyo, Japan: and concluded that Kinesio taping is an operative management in improving knee muscle strength in healthy people. In addition, this taping procedure might be helpful in maintaining full range of motion.
26. **Wallis J** (1999) Effects of kinesio taping on pain perception of athletes with patellofemoral pain syndrome—A pilot study. And concluded that KT reduces patellofemoral pain.
27. **Garcia D** (2001) Kinesio taping for the sense of balance on knee” and concluded that KT improves knee balance when applied on ankle.
28. **Goo J** (2001) “A new step for treatment of ankle sprain”. And concluded that KT helps in decreasing knee pain and provide support in ankle sprain.
29. **Ogura R** (1998) “Overuse syndrome for long-distance runners and taping” and concluded that, Kinesiotaping reduce the over used syndrome in long distance runners.
30. **Oliveria R** (1999) “Soft tissue injuries in sports people” and concluded that pain and swelling after soft tissue injury is controlled by kinesiotaping.

## **CHAPTER III**

### **METHODOLOGY**

#### **3.1 Purpose of Study**

The purpose of the study is to find out the efficacy of kinesiotaping on lower trunk flexion range of motion in tennis player.

#### **3.2 Need & Significance of the Study**

1). Literature suggests that it's not possible to gain effective performance without appropriate flexibility. So, if kinesiotaping proves to be an effective measure to increase flexibility of lower trunk then performance of tennis player can be enhanced using this measure.

2). This method if justified then it will also help the player by not only enhancing the flexibility but also support and protection in biomechanically using the extreme ranges of the body.

#### **3.3 Statement of Question**

Is there any significant effect of kinesiotaping on lower trunk flexion range of motion in tennis player?

#### **3.4 Hypotheses**

##### **Experimental Hypothesis:**

There is significant effect of kinesiotaping on lower trunk flexion ROM in tennis player.

##### **Null Hypothesis:**

There is no significant effect of kinesiotaping on lower trunk flexion ROM in tennis player.

### **3.4 Sample**

- a. Number of subjects- 30
- b. Source of the subjects : Study was conducted in Life Spring, Tennis Academy, Coimbatore (Tamil Nadu)
- c. Method of Selection- Sample of Convenience.

### **3.5 Study Design:**

Pre-test post-test single group experimental design.

### **3.6 Study Setup And Duration:-**

Total duration of the study 6 weeks.

Each subject needs 2 days (Day 1 and 2).

Each session of 1 hour for a day.

### **3.7 Variables**

- a. Independent variable: kinesiotaping.
- b. Dependent variable: lower trunk flexion flexibility.

### **3.8 Inclusion Criteria**

- a. Age group 18-24 years.
- b. Only male players were taken.

### **3.9 Exclusion Criteria**

- a. Players having any low back injury with in 6 month.
- b. Players having any pathology of hip, knee, thigh, and back.
- c. Other factor affecting the flexibility was not calculated. Like temperature etc.

### **3.10 Measurement tools**

1. Kinesio tape,
2. Measuring tape.
3. Step stool
4. Scissor

### **3.11 Protocol**

Pre and post test experimental design 30 players were taken for study. The study is done in two phases:-

#### **PHASE 1 :-**

Trunk flexion range of motion will be recorded without kinesio taping before and after match ( 1 hr. play ).

#### **PHASE 2 :-**

Trunk flexion range of motion will be recorded without kinesio taping before match, with kinesiotaping before and after match ( 1 hr. play).

### **3.12 MEASUREMENT PROCEDURE:-**

Initially each player was measured for lower trunk range of motion using a tape measure. Subjects performed a static stretch for Subject perform a static stretch for 15 seconds in the flexion of trunk that were tested for injury prevention purposes. For flexion, subjects stood on the step stool with arms in a neutral position, heels together, and knees straight. Subjects bent forward as far as they could with fingers straight. The distance between the tip of third finger and the floor was measured (Figure 1).

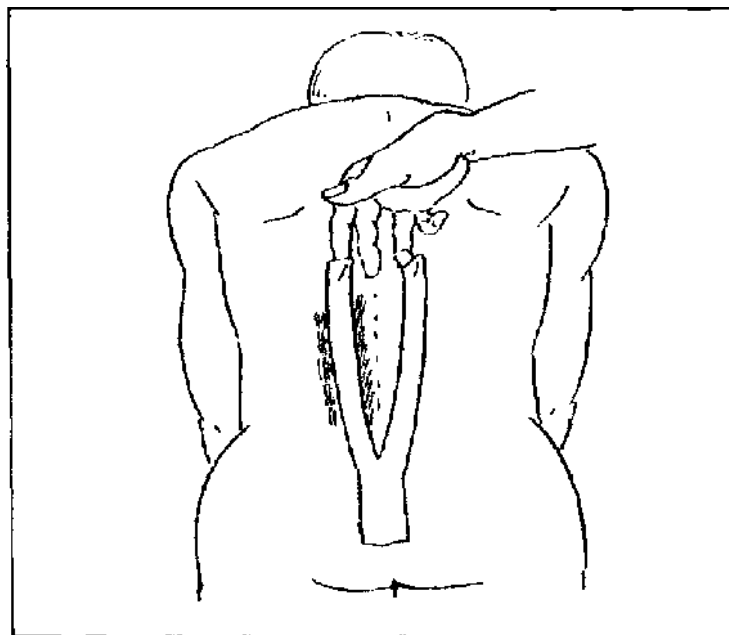


**Figure 3.1: flexion measurement**

Range of motion was measured three times for reliability, before and after the match.

### **3.13 Taping Method:-**

Subjects were taped using a method proposed for the sacrospinalis muscle. Y-shaped (2-inch width and 11-inch length) tape was used in the study (Figure 2) (10). The taping technique required subjects to stand erect while the origin of the Y-shaped taping technique was attached over the centre of the sacrum. The origin of the Y tape was attached without stretching the kinesio tape while subjects gradually bent forward. The same procedure was applied to the other end of the Y tape. A 5-degree angle was maintained within the valley of the Y tape. The Y-shaped tape was applied from the origin of the sacrospinalis to the insertion as theorized to support a muscle function (Figure 2).







**Figure 3.2: Y- shape kinesio taping for lower trunk.**



**Figure 3.3:- Low back kinesiotaping in stretch position**



**Figure 3.4:- Low back kinesiotaping in relax position**



**Fig-3.5- MATERIAL USED**

1. SCISSOR
2. MEASURING TAPE
3. KINESIOTAPE.

## CHAPTER IV

### DATA ANALYSIS AND RESULTS

This data collected from the study were statistically analyzed. The statistical tests for this purpose were –

#### 4.1 Paired t – test for intra group [Pre – Post] test comparison

Formula used was -  $t = \frac{\sum d}{\sqrt{\frac{N\sum d^2 - (\sum d)^2}{N-1}}}$

Where

- D = the total of the differences
- ( d)<sup>2</sup> = total of the differences, squared
- d<sup>2</sup> = the total of the squared differences
- N = No. of subjects

#### 4.2 Arithmetic Mean:

$$\bar{X} = \frac{\sum}{N} = \frac{\text{Total Score}}{\text{No. of Subject}}$$

This mean was subtracted from each score to calculate  $(X - \bar{X})$

The  $(X - \bar{X})^2$  was calculated for each subjects and add to get  $\sum(X - \bar{X})^2$

This variance [S] was calculated by  $\frac{\sum(X - \bar{X})^2}{N-1}$

### 4.3 Standard Deviation [SD]

$$SD = \sqrt{\frac{\sum(x-\bar{x})^2}{N-1}}$$

X = individual score

$\bar{x}$  = Mean Score

N = Total no. of Score

$$SE = \frac{SD}{\sqrt{N-1}}$$

Degree of freedom:

DF related t-test = N-1

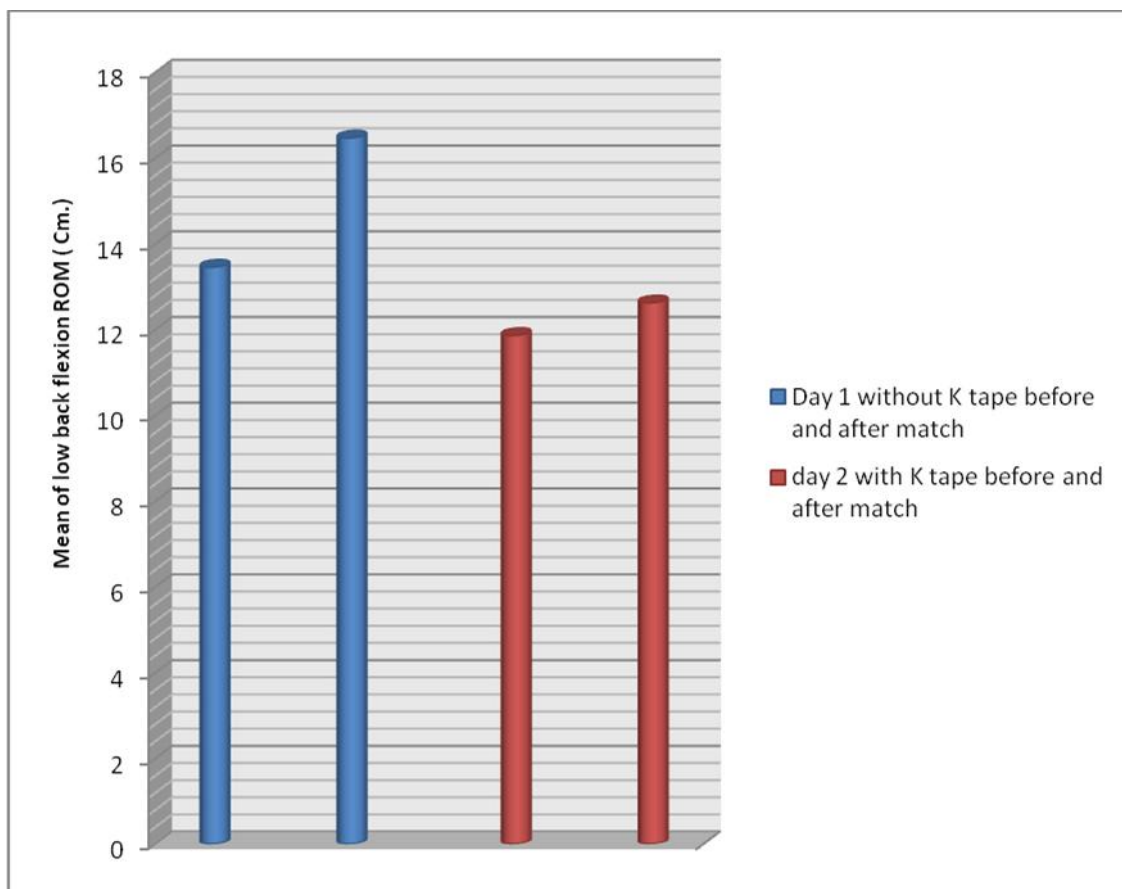
DF unrelated t-test =  $N_1+N_2-2$

**Table : 4.1**

**ANALYSIS OF LOW BACK FLEXION PRE AND POST WITHOUT KINESIOTAPE V/S PRE AND POST WITH KINESIOTAPE :-**

<b>GROUPS</b>	<b>DAY 1 WITHOUT KT</b>		<b>DAY 2 WITH KT</b>	
	<b>Before match</b>	<b>After match</b>	<b>Before match</b>	<b>After match</b>
Mean	13.457	16.467	11.863	12.623
SD	5.141	5.434	5.146	5.098
t-value	15.6831		6.8492	
Significance	Statistically significant.		Statistically significant.	

Using a paired 't' test on the data Low back flexion ROM(flexibility) of tennis players without K Tape on day 1 and with K Tape on day 2 match the 't' values was found to be 15.683 and 6.849 respectively ,compared at 5% level of significance. This implies that there is significant difference in low back flexion ROM of tennis players reflects improvement in flexibility with application of K Tape.



**Fig: 4.1** Graphical representation of low back flexion ROM pre and post without kinesiotape v/s pre and post with kinesiotape.

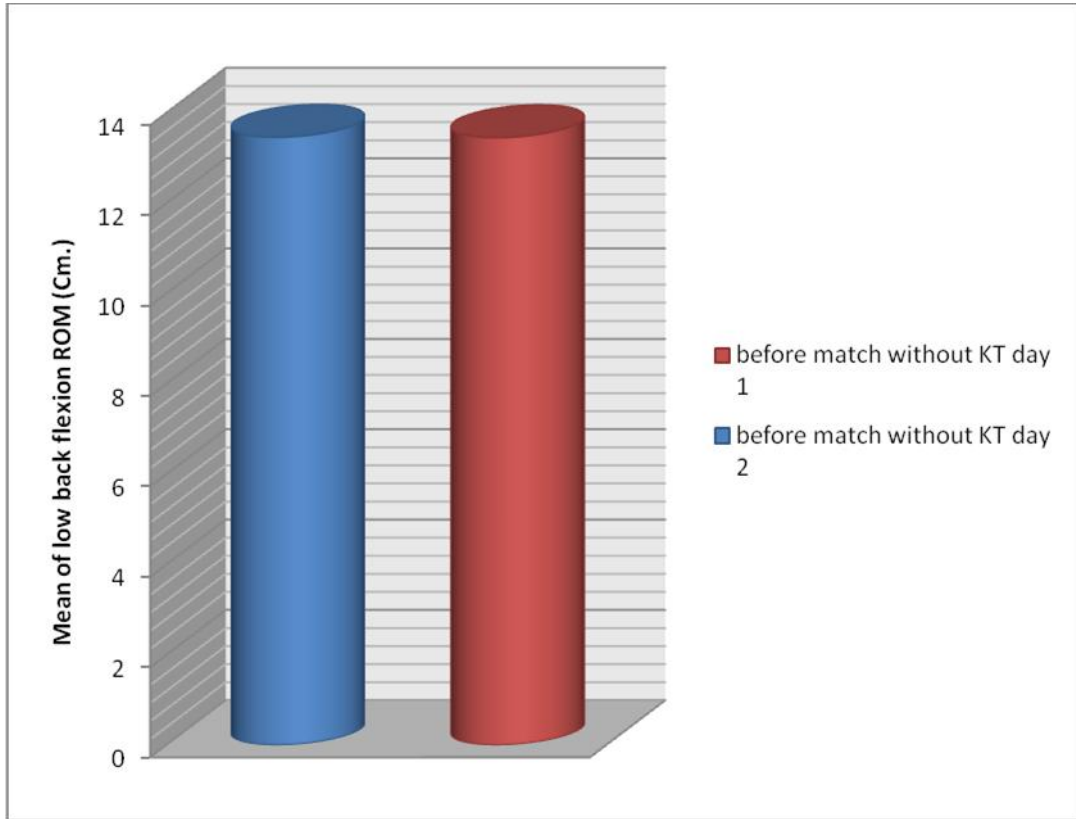


**Table :4.2**

**ANALYSIS OF LOW BACK FLEXION ROM DAY 1 BEFORE MATCH WITHOUT KINESIOTAPING V/S DAY 2 BEFORE MATCH WITHOUT KINESIOTAPING :-**

<b>GROUPS</b>	<b>Day 1: Before Match Without Kinesiotaping</b>	<b>Day 2: Before Match Without kinesiotaping</b>
Mean	13.457	13.447
SD	5.141	5.133
t-value	0.4741	
Significance	Not statistically significant.	

Shows mean of low back flexion ROM (flexibility) of tennis players without Ktape on day 1 and day 2 before match 13.457cm and 13.447cm respectively . Using a paired ‘t’ test on the data the ‘t’ values was found to be 0.4741,compared at 5% level of significance. Hence accepting the null hypothesis i.e.no significant difference found between the mean of two groups indicating similar pre experimental value.



**Fig:4.2** Graphical representation of low back flexion ROM day 1 before match without kinesiotape v/s day 2 before match without kinesiotape.

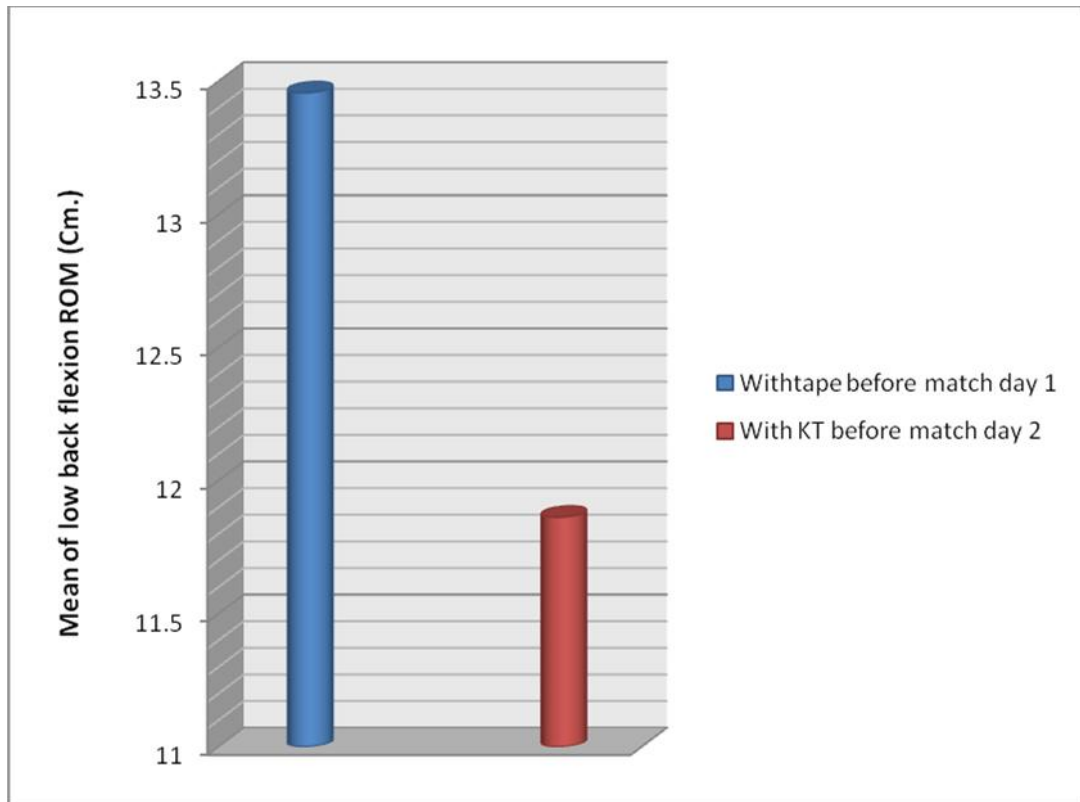
**Table: 4.3**

**ANALYSIS OF LOW BACK FLEXION ROM WITHOUT KINESIOTAPING BEFORE MATCH DAY 2 V/S WITH KINESIOTAPING BEFORE MATCH DAY**

**2:-**

<b>GROUPS</b>	<b>Day 2 Before Match Without Kinesiotaping</b>	<b>Day 2 Before Match With kinesiotaping</b>
Mean	13.457	11.863
SD	5.141	5.146
Tvalue	9.2099	
Significance	Statistically significant.	

Shows mean of Low back flexion ROM (flexibility) of tennis players without K tape on day 2 and with K tape day 2 before match 13.457cm and 11.86cm respectively. Using a paired test on the data the 't' value was found to be 9.20, compared at 5% level of significance. As calculated t value greater than tabulated t value hence rejecting the null hypothesis. Which implies that there is significant difference in low back flexion ROM of tennis players immediately after application of k tape.



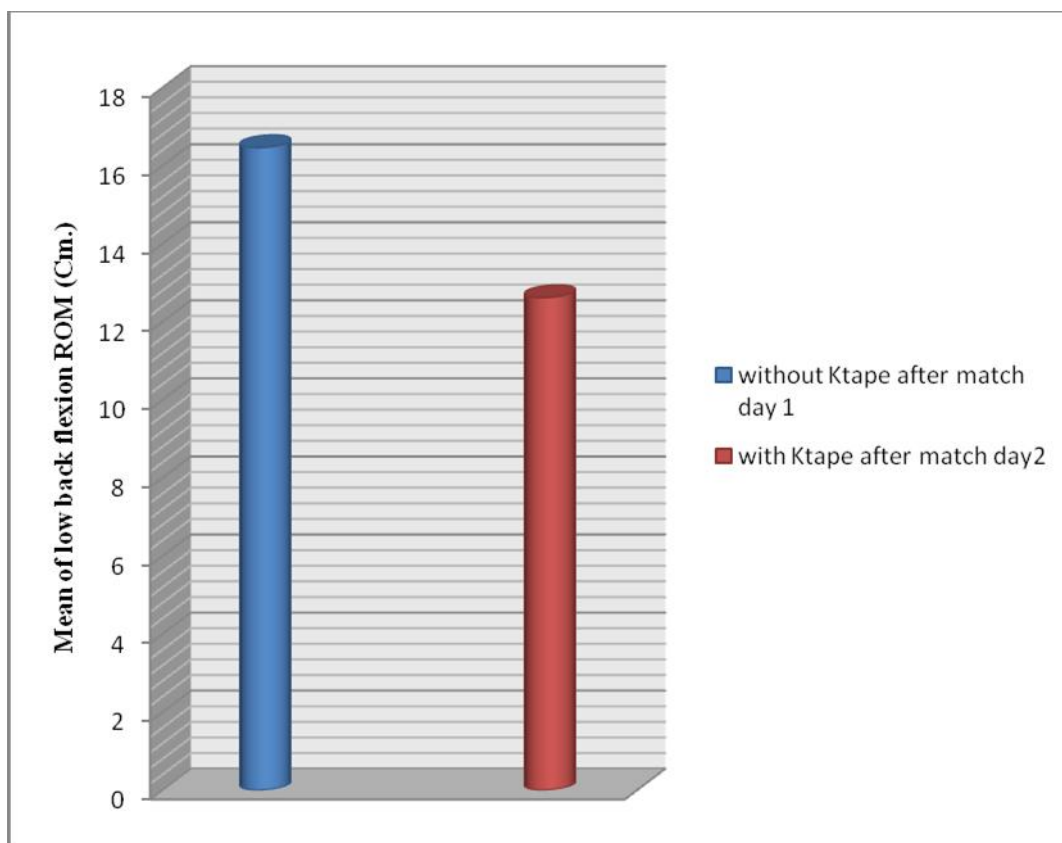
**Fig: 4.3** Graphical representation of low back flexion ROM Without kinesiotaping before match day2 v/s With kinesiotaping before match day 2.

**Table:4.4**

**ANALYSIS OF LOW BACK FLEXION ROM WITHOUT KINESIOTAPING  
AFTER MATCH V/S WITH KINESIOTAPING AFTER MATCH:-**

<b>GROUPS</b>	<b>Day 1 After Match Without Kinesiotaping</b>	<b>Day 2 After Match With Kinesiotaping</b>
Mean	16.467	12.623
SD	5.434	5.098
t-value	18.9111	
Significance	Statistically significant.	

Shows mean of Low back flexion ROM(flexibility) of tennis players without K tape after match on day1 and with k tape on day 2 after match 16.467cm and 12.623cm respectively . Using a paired ‘t’ test on the data the‘t’ values was found to be 18.9111,compared at 5% level of significance. As calculated t value greater than tabulated t value hence rejecting the null hypothesis. Which implies that there is significant difference in low back flexion ROM of tennis players immediate after application of k tape reflects it helps in increasing the flexibility.



**Fig:4.4** Graphical representation of low back flexion ROM without kinesiotaping after match day 1 v/s with kinesiotaping after match day 2.

## CHAPTER V

### DISCUSSION

The present study was undertaken to determine the efficacy of kinesio taping on lower trunk flexion range of motion (flexibility) in tennis players. The study was done on tennis players. Their pre and post game (1 hr. play) lower trunk flexion range of motion was measured with and without kinesio tape on low back.

Data collected through study had shown significant difference in lower trunk flexion ROM of players before and after 1 hr. play without kinesiotape, as compared to same group before and after 1 hr. play with kinesiotape ( $t=9.2099$ ). It indicates that Kinesio Tape, when applied to healthy colligate tennis players, helps to maintain the flexibility of low back muscles.

The reasons for this improvement may be related to physiological mechanisms by which KT is presumed to have a therapeutic benefit:

- 1) Gather fascia to align the tissue in its desired position.
- 2) Lift the skin over areas of inflammation, pain, and edema.
- 3) Increase stimulation of the mechanoreceptors to either stimulate or limit movement.
- 4) Provide a positional stimulus to the skin.
- 5) Decrease pressure over the lymphatic channels that provide a path for the removal of exudates.<sup>13</sup>

These physiological mechanisms still remain theoretical because there are limited researches to support these concepts. This may suggest that, as the motor units in the low back muscles fatigued during the workout, the KT aids in flexibility and muscle contractions.

Other two studies measuring muscle activation after KT application found results similar to those of the current study. A study done by Yoshida et al.<sup>36</sup> effect of kinesiotaping in lower trunk range of motion and finds increase in active range of motion in lower trunk muscles.

Another study found an increase in trunk flexion in kinesiotape group by Salvatsalvat I et al<sup>30</sup>, These studies support the current study; possibly suggesting that, as the low back muscles fatigued, KT may have had an effect on recruiting additional motor units and increase in circulation to the contracting muscle and improves flexibility.

Another objective of this study was to find out the immediate effect of KT on flexibility (trunk flexion ROM) on low back muscle in tennis players. On statistical analysis significant difference was found in trunk flexion range of motion just after the application of KT on tennis player ( $t=9.2099$ ) reflecting improvements in Flexibility.

When KT was applied over the low back muscles from centre of sacrum at the origin of sacrospinalis to its insertion on low back. According to Kaset al<sup>13</sup>, this technique will cause an increase in local circulation of blood and stimulation of mechanoreceptor which is then perceived by the brain as a proprioceptive stimulation.

However, a study by Halsethet al<sup>9</sup>, found that KT does not affect joint position sense/proprioception at the ankle in healthy patients, as measured by a reproduction of joint position sense apparatus. In a study by Murray and Husk<sup>23</sup>, it was found that KT,



when applied to the ankle, caused an increase in joint position sense at 10° plantar flexion and therefore may have caused stimulation to the cutaneous mechanoreceptors.

Still, the role of cutaneous and subcutaneous mechanoreceptors may have some effect on proprioception and neuromuscular control on injured patients who have a diminished sense of proprioception. Theoretically, an external device may cause stimulation of the cutaneous mechanoreceptors and enhance somatosensory proprioceptive input to joint receptors. However, there is still much controversy concerning the proprioceptive benefit of adhesive tape, braces, etc.

Another factor that may have played a role in this study is time from application of the tape to activity. The current study tested subjects 60 minutes after tape application, which was determined based on recommendation from Kase et al.<sup>13</sup> Slupik et al,<sup>31</sup> reported that KT application to the vastusmedialis showed a significant increase in bioelectrical muscle activity 24-72 hours after initial application. However, there was not a significant increase in activity 10 minutes or 96 hours after initial application. This finding does not support the protocol set out by Kase et al<sup>13</sup>, that stated “The tape needs approximately 20 minutes to gain full adhesive strength.” The current study tested subjects 60 minutes after tape application, and it may be inferred that the results would have differed if tape application were applied at least 24 hours before testing, as has shown to be effective in previous studies.

Hence, results of the study suggest that KT may increase and help in maintaining active ROM of lower trunk flexion in Tennis players.

### **Limitations of the study-**

- 1) Small sample size. To establish efficacy of treatment a large study sample is required.
- 2) It did not include a control/placebo group, and group assignment of subjects was not blinded from the investigators. Thus, subjects could have expected an effect from using kinesio tape or anticipated the researcher's expectation toward the effects of kinesio tape.

### **Further research –**

- 1) The tape measure method used to assess trunk ROM may not have been the most accurate method to assess possible physiological changes as a result of using kinesio tape. Further studies using electromyography and infrared thermography to detect changes in muscle excitability and temperature are warranted to assess the effects of KT on physiological changes.
- 2) To determine if kinesio tape produces the same effects on patients with low back pain and other joint pathology.
- 3) More research should be done on the effects of low back flexibility over an extended period of athletic activity on a larger subject pool.

## **CHAPTER VI**

### **CONCLUSION**

Our research indicates that kinesiotaping when applied to tennis players, it enhance low back muscular flexibility (ROM) than that seen in a “no tape” condition. Also when KT using a Y flexion pattern was applied, it improve the active range of motion in lower trunk flexion.

Although, future research must be done to test if Kinesiotaping has a therapeutic benefit for athletes with chronic back pain.

Hence, null hypothesis that There is no significant effect of kinesiotaping on lower trunk flexion ROM in tennis player rejected and experimental hypothesis is accepted.

However, since this study was of sample size, further studies can be done with large sample size which would support this conclusion more strongly.

Despite limitation, this study provides evidence for the positive effect of K Tape in improving flexibility in Tennis players.

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## APPENDIX – 1

### CONSENT FORM

This is to inform that I voluntarily agree to give my full co-operation for research work on “**Efficacy of kinesiotaping in lower trunk flexion range of motion in tennis players**” by **Mr. N. Anoop** and I have opportunity to ask any question about my participation and all my queries have been answered to mine satisfaction. I have understood the effect of application of intervention, possible risks and benefits.

I hereby authorize and grant permission to carry out any assessment and procedure as may be necessary to assess and treat my condition.

Date

Signature of researcher

Signature of subject



## **APPENDIX –II**

### **1. DEMOGRAPHIC DATA**

- a. Name
- b. Age
- c. Sex
- d. Height, weight

### **2. HISTORY**

- a. Past medical and medical history
- b. Playing history

### **3. OBSERVATION**

- a. Built
- b. Posture

### **4. EXAMINATION**

#### **a. GAIT ASSESSMENT.**

#### **b. MMT**

- Low back muscles.
- Hamstrings
- Quadriceps
- Iliopsoas

#### **c. FLEXIBILITY**

- Trunk range of motions

- Bilateral Hip range of motions.