# The Efficacy of Kinesio Taping as an Adjunct to Therapeutic Exercises in Treatment of Postural Scoliosis

# Chapter I
# Introduction

- Scoliosis is defined as a lateral deviation of the spine from the normal plumb line. Commonly, there is a rotational component and deviation also in the sagittal plane (kyphosis or hyperlordosis). When scoliosis presents in adults, it is often painful

- Incidence : 2% to 3% in childern ages 10-16 years
- Girles being more at risk for severe progression by aratio of 3.6 to 1

- Physical examination:
- Appearance of the patient
- Perform adam forward bending test
- Calculation of cobb’s angle

- Conservative management:
- Bracing
- Therapeutic exercises
- Electerical stimulation

- Postural stresses such as in scoliosis are a form of mechanical muscle stress that has been considered to be a cause of myofascial trigger points (MTP) formation and activation.
- Trigger points are small (2 mm to 5 mm in diameter) nodules of hyper-sensitivity located in taut, "rope-like" bands of skeletal muscle that are detectable through palpatory examination**,** muscle overload, acute trauma, and microtrauma, generally are agreed to be the most likely causes of myofascial trigger points development, other causes may include muscle deficiency, joint dysfunction, sleep disorders, postural dysfunction

- The common muscles can be affected with trigger point in scoliosis are the iliocostalis thoracies and iliocostalis lumborum
- Range of motion around a joint moved by muscles with trigger points is often limited. The end range may be painful, but limitation of the range may be painless unless the patients is pushed to move beyond comfort

- Kinesio Taping (KT) is an elastic tape that can be stretched to 140% of it’s original length, thereby exerting a constant shearing force on the skin, KT is conceived to be a therapeutic way with the following effects on musculoskeletal system. It corrects muscle function by stimulation week muscles, reduces pain througth neurological supression, improves blood and lymph circulation

- Kinesio tape, an alternative taping technique, has been theorized to improve a variety of physiological problems, including the range of motion, based on the functions of the tape and Thus has been theorized to be an effective treatment to restore muscle function and decrease pain

**Statement of the problem:**

- This study was designed to find a new technique ( the application of kinesio taping) that may help in improveing the signs and symptoms of postrual scoliotic patient, thus, our question is, is there an efficacy of kinesio taping as an adjunct to therapeutic exercises in treatment of postural scoliosis?

**Purpose of the study:**

- The purpose of the study is to determine the efficacy of kinesio taping as an adjunct to therapeutic exercises in treatment of postural scoliosis

**Significance of the study:**

- Lateral flexion of a scoliotic vertebra immediately limits its ability to move in flexion-extension or rotation. Limited range of motion can, in turn, translate abnormal stresses into the costovertebral joints predisposing them to articular dysfunction
- This articular dysfunction will finally lead to sensation of heightened muscle tension or in another word, trigger points

- The trigger point is responsible for local tenderness and referred pain that is the result of trigger point-induced central sensitization. Nociceptive activity that arises from trigger point of painful muscle activates spinal cord dorsal horn neurons and sensitizes the central nervous system

- Kinesio taping may alleviate pain through a reduction in mechanical stress on the tissue. Kinesio taping is applied in a manner that creates convolutions in the skin, which are believed to increase the interstitial spaces between sheets of fascia, thereby reducing stiffness, improving joint range of motion, and decreasing pain. Pain relief is believed to be mediated by a reduction in the mechanical load on free nerve endings within the fascia

**Delimitations:**

- 1- This study was delimited to 30 patients (both sexes).
- 2- Patients age ranged between 15 to 30 years.
- 3- Postural scoliosis with cobb’s angle arranged from 15 to 30 degrees at thoracic region (primary curve).

**Assumptions:**

- It was assumed that the patient would follow the instructions during the treatment protocol.

# Chapter III
# Subjects, Materials and Methods

**Subjects:**

- Thirty patients with postural scoliosis,were assigned randomly through lottery method into two equal groups. fifteen patients in group(A) received Kinesio Taping and therapeutic exercises, and fifteen patients in group (B) received therapeutic exercises. Inorder to do that, we put thirty pieces of paper into a box;half of them were labelled as (A) and the other half labelled as (B). the patient was asked to pick one piece of paper to know which group he would be assigned. all patients were familiarized with the procedures of treatment and signed a consent form before participating in the study

**Inclusion criteria:**

- Postural scoliosis (cobb's angle ranged between(15-30$^{o}$) at thoracic curve taken after performing adam forward bending test.
- History of back pain caused by scoliosis.
- Scoliosis with iliocostalis thoracis and iliocostalis lumborum muscles affected by trigger points.

**Exclusion criteria:**

- History of previous back surgery.
- Structural idiopathic scoliosis.
- Leg length discrepancy
- Other disorders in the vertebral column ( prolapsed disc, fracture)

**Instrumentations:**

- **A-Instrumentations used for evaluations:**
- **Pain assessment**

1-Pain was assessed by visual analog scale **(VAS).** This scale allows continuous data analysis and uses a 10cm line with 0 (no pain) and 10 (killing pain). The patient place a mark along the line to denote his level of pain

**2-Pressure algometer:** measures of trigger points (TP) treatment effect.

pressure algometer has a flat circular metal probe dressed in several layers of lint and measuring 1 cm in diameter. Force was displayed digitally in increments of 0.1 N/cm2. The algometer was mounted vertically on a purpose-built stand to enable force to be applied perpendicular to the measurement site


WAGNER
FDX
LO BAT
T C PEAK
0.01
lbf
kgf
N
ozf
ZERO
PEAK
UNITS
ON/OFF
SELECT
SCROLL
ESCAPE

- Measurement of iliocostalis thoracis and iliocostalis lumborum trigger points

**2-Functional disability*:***

- Functional disability of each patient was assessed by Oswestery disability questionnaire. It is valid and reliable tool. It consists of 10 multiple choice questions for back pain, patients select one sentence out of six that best describes his pain, higher scores indicate great pain

| | |
|---|---|
| Scores (0-20%) | Minimal disability |
| Scores (20%-40%) | Moderate disability |
| Scores (40%-60%) | Severe disability |
| Scores (60%-80%) | Crippled patient |
| Scores (80%-100%) | Patients are confined to bed |

**3-Range of motion assessment:**

- **Assessment of back flexion**

The investigator standed behind the standing patient to identify the posterior superior iliac spines, and then an ink mark was drawn along the midline of the spine horizontal to the posterior superior iliac spines. Another ink mark was made on $C_7$. The tape measure was lined up between skin markings, the distance between superior and inferior skin marks would be measured. Then the investigator was instruct the patient to bend forward into full back flexion and the new distance between superior and inferior skin marks would be measured. The change in the difference between marks was used to indicate the amount of back flexion

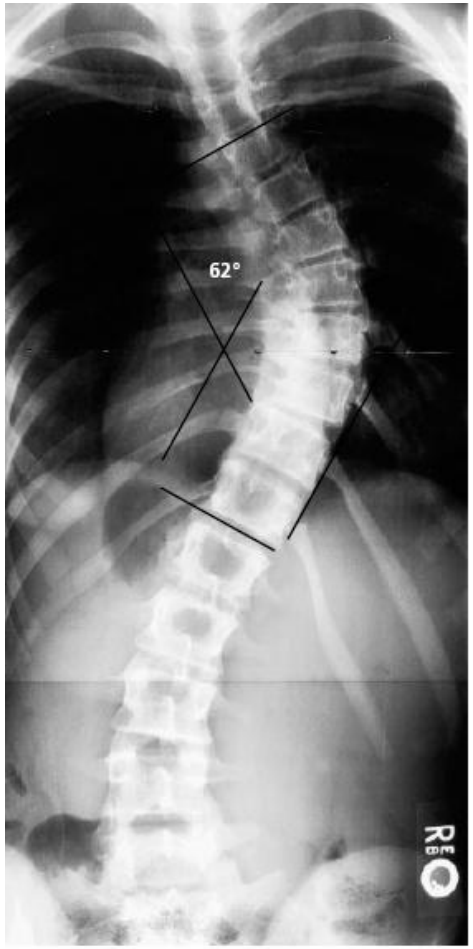
- **b-Assessment of back extension:**
- identify the posterior superior iliac spines, and then an ink mark was drawn along the midline of the back spine horizontal to the posterior superior iliac spines. Another ink mark was done on C7 above the original mark. The tape measure was lined up between the skin markings. the distance between superior and inferior skin marks was measured.

- investigator was instruct the patient to bank backward into full extension and the new distance between superior and inferior skin marks would be measured as a straight line. The change in the normal difference between marks was used to indicate the amount of back extension

- **c- Assessment of Lateral flexion:**
- Lateral flexion was measured as the distance from the tip of the index finger to the floor at maximal comfortable lateral flexion


**4- Measurement of cobb's angle**

- loaded x-ray was measured from standing position, take the view from the occipute to the sacrum to determine the location and severity of curve
- angle was obtained by drawing lines perpendicular to the transverse axes of the upper and lower end vertebrae and these lines would intersect to get the cobb's angle


62°
R

- **B-Treatment procedure for Group (A): Kinesio Taping and Therapieutic exercise:**
- Kinesio Taping was applied and changed every 5 days
- Application of a mechanical correction technique to provide a stimuli in which the body was adjust to increase tension in the skin.

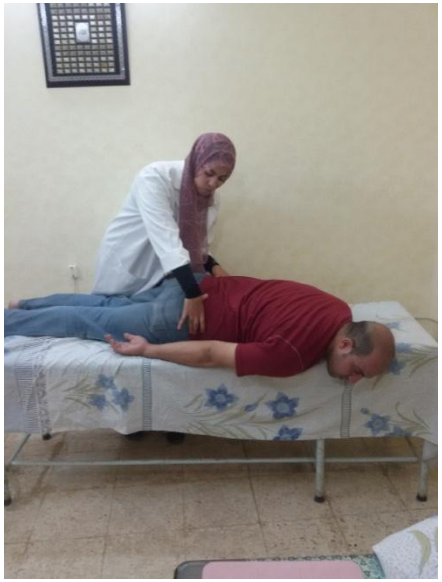
- For the posterior superior region, begin by placing the base of the Kinesio Y strip (approximately 6-8 inches) two inches below the area to be treated, with no tension. With one hand, hold the base to ensure no tension would be added. Have the patient move into back flexion with rotation in the opposite direction of desired correction. Apply light to moderate, tension (25-50% of available) to the tails of the Kinesio Y stripthe "recoil" action of the tails would provide the stimulus to the skin. initiate glue activation

- Application of a fascia correction technique to provide a deeper stimuli to reduce tension within the layers of the tissue, Begin with a Kinesio Y strip of approximately 6-8 inches. Place the base medial to the area to be treated, with no tension. have the patient move into back flexion with rotation in the opposite direction of desired correction. Apply light tension (25% of available) to the tails of the Kinesio Y strip ,with an oscillating motion. intiate glue activation

- For the posterior lower region, the technique applications was repeated, except the motions was reversed to provide stimulus in an opposite direction. The desired effect is to "unwind" the spine

- **Treatment procedure for *Group (B): Therapeutic exercises***
- **Receive the exercise program: three sessions per week for successive six weeks**

- **1- To stretch tight structures on the concave side of the curve**
- Shift the apex of the curve to the midline and passively over correct the curve for 30 seconds stretching, 3 repetitions, 3 sets.
- **patient prone:**
- Stabilize the patient at the iliac crest on the side of the concavity. Have the patient reach toward the knee with the arm on the convex side of the curve while stretching the opposite arm up and overhead



- **b. Patient kneel-sitting (to stabilize the lumbar curve):**
- The patient leans forward so the abdomen rests on the anterior thighs stabilize the patient at iliac crest, arms are stretched overhead bilaterally. Have the patient laterally bend the trunk away from the concavity

- **c. Patient side lying on the convex side:**
- 1- The patient is positioned side-lying with a rolled towel at the apex of the convexity; the lumbar spine is stabilized by the therapist.

- 2- Side-lying over the edge of a mat table to stretch light structures of a right thoracic scoliosis. The therapist stabilizes the pelvis

- **2- Exercises to Strengthen for Back and Trunk Musculature on the Convex Side of the Curve**
- Patient side-lying on the concave side of the curve.
- a-The therapist should stabilize the patient at the iliac crest
- b-With lower arm across the chest, have the patient derotate the trunk, lift up the head and shoulders (lateral trunk bending), and slide the top arm down to the knee

- Progress the difficulty of the above-mentioned exercise by having the pa-tient clasp hands behind the head and then laterally flex the trunk against gravity. The exercise lasting for 6 to 10 second for 10 repetitions

- Patient crock lying : Anterior pelvic tilt with press against the mat table with shoulder and buttock

- from prone position:  Raise head, shoulder, and both lower limbs upward

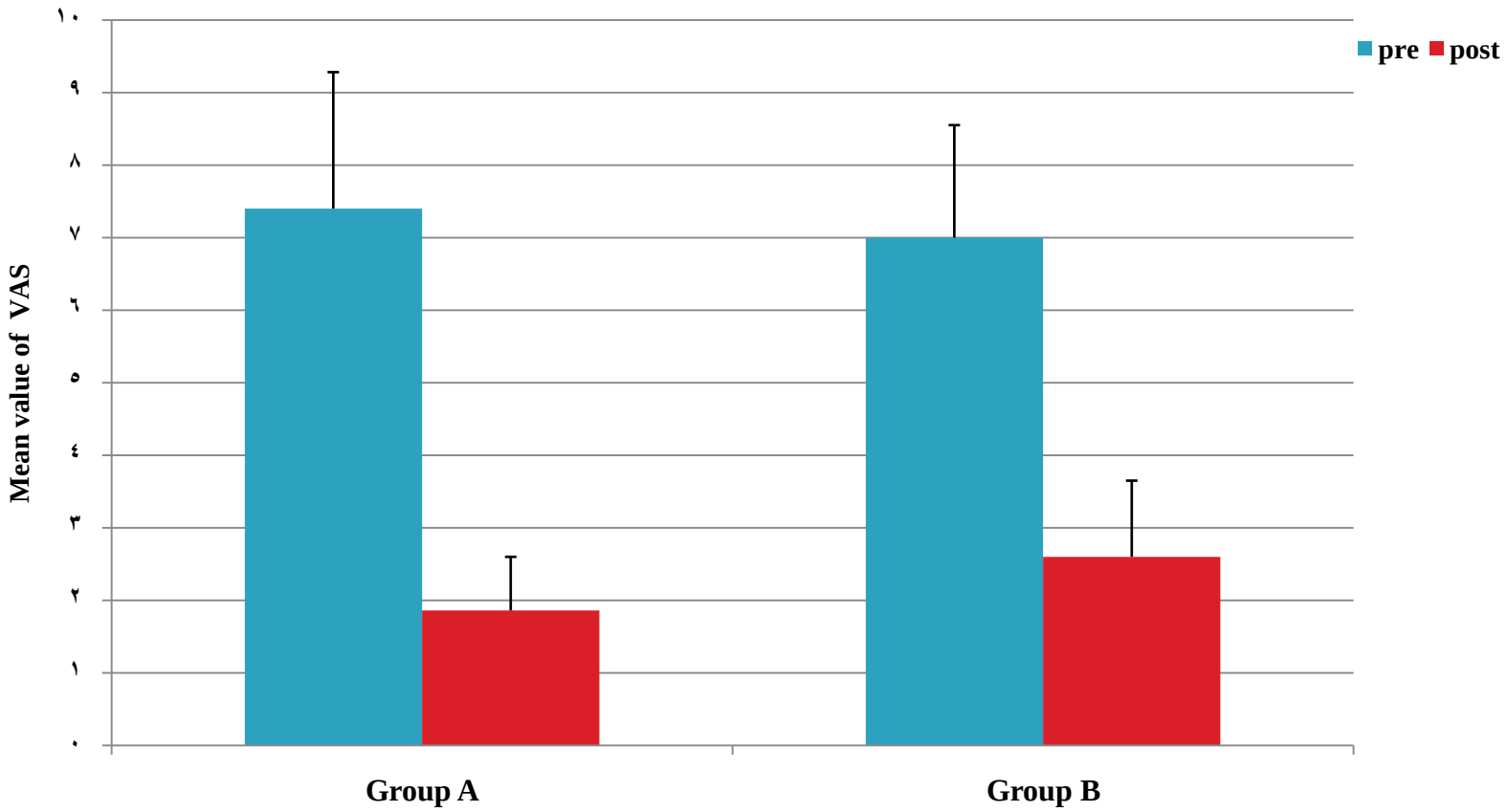
# CHPTER IV
# Results

- 2X2 Mixed Design MANOVA was performed on the examined sample with the alpha level 0.05. 2X2 Mixed Design MANOVA was conducted to compare VAS, PPT for iliocostalis thoracis and iliocostalis lamborum, cobb's angle, oswestry, and ROM of flexion, extension, right bending, and left bending between both groups in the “pre” and “post” tests. In addition, it was intended to compare between the “pre” and “post” tests for each variable at each tested groups

1-VAS

Within group: there was a significant reduction in VAS at post treatment in compare to pre treatment

Between groups: the mean values of the "Post" test between group (A) and group (B) showed there was significant reduction of VAS in favor to group A


pre
post
Mean value of VAS
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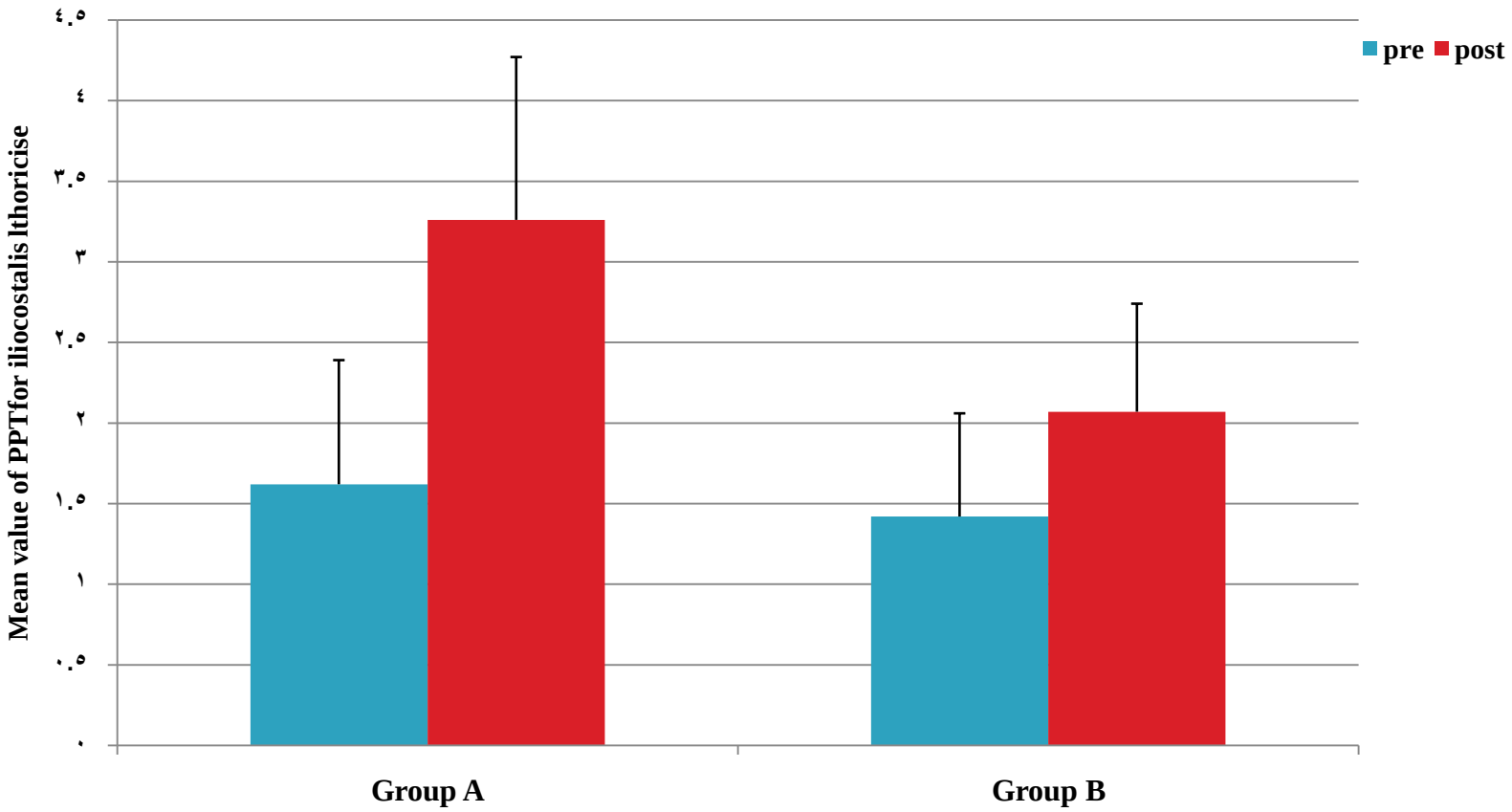
Group A
Group B

**2-PPT for iliocostalis thoracis:**

Multiple pairwise comparison tests revealed that the mean values of the "Post" test between group (A) and group (B) showed there was significant increase of PPT for iliocostalis thoracis in favor to group A


Mean value of PPTfor iliocostalis lthoricise
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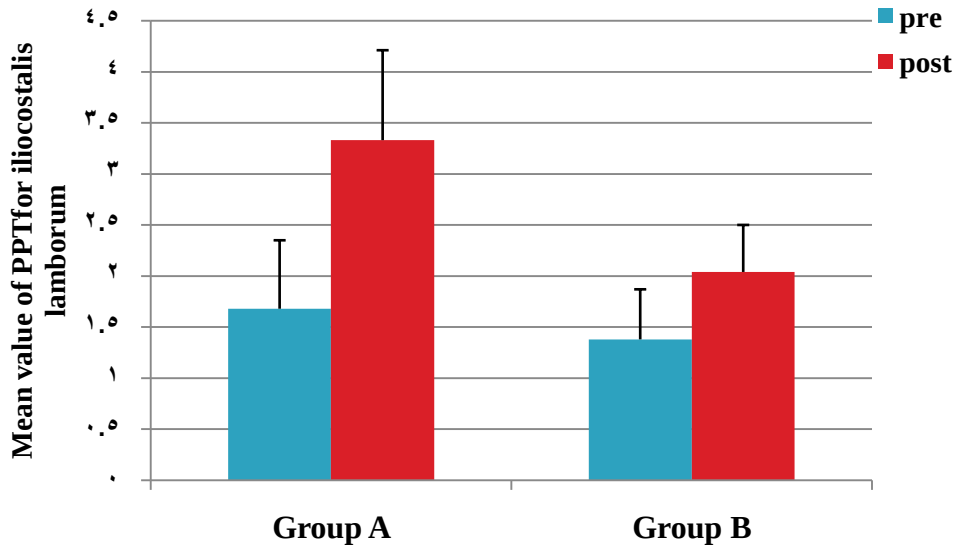
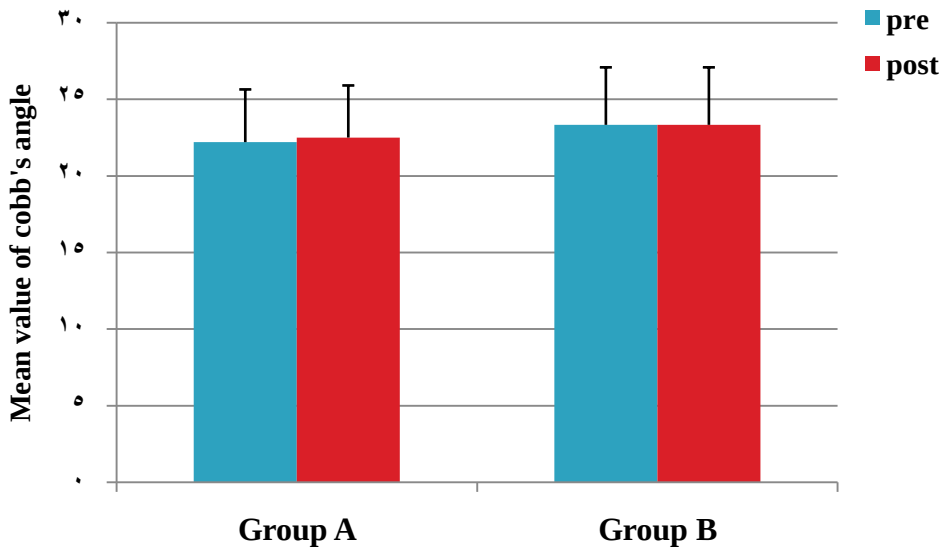
pre
post
Group A
Group B

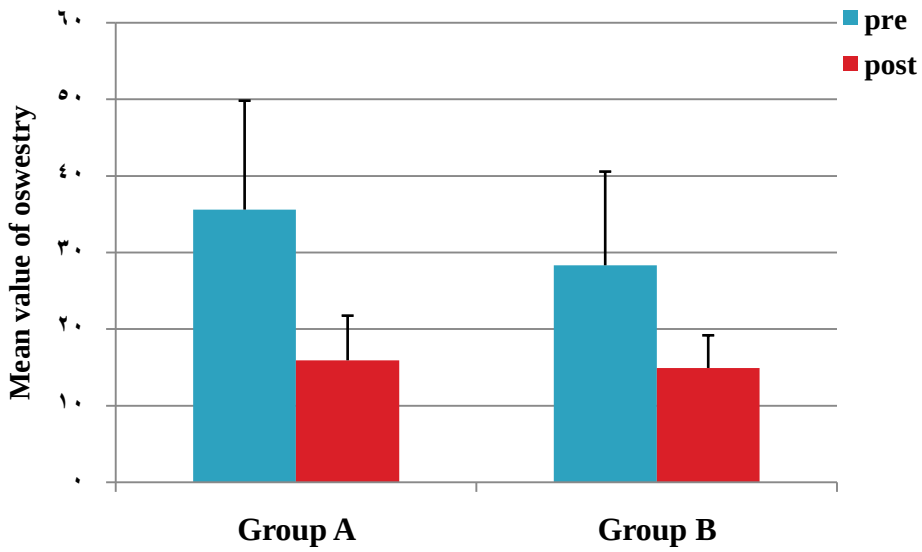
**3-PPT for iliocostalis lamborum:**there was significant increase of PPT for iliocostalis lamborum in favor of group A



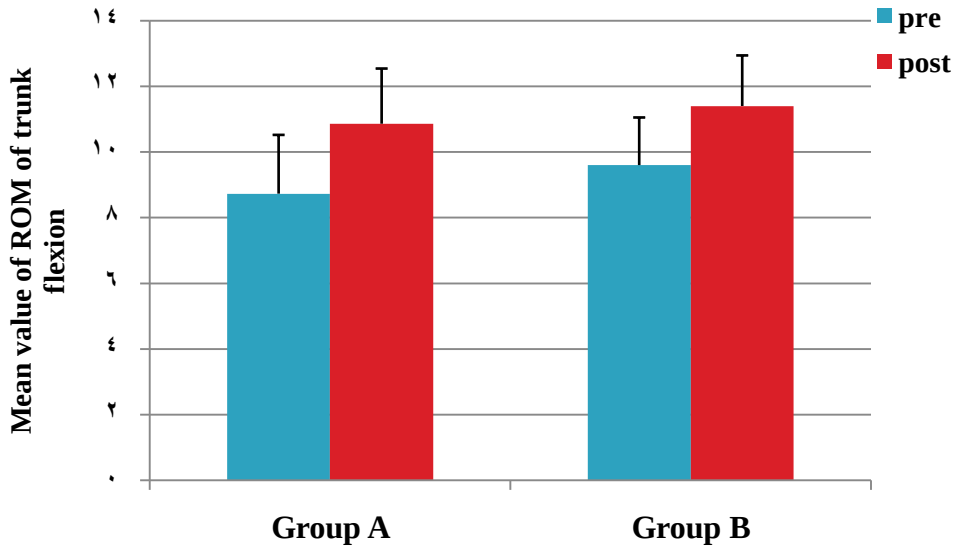
**4-Cobb's angle:**there was no significant differences of pre and post tests between group(A)and group (B)



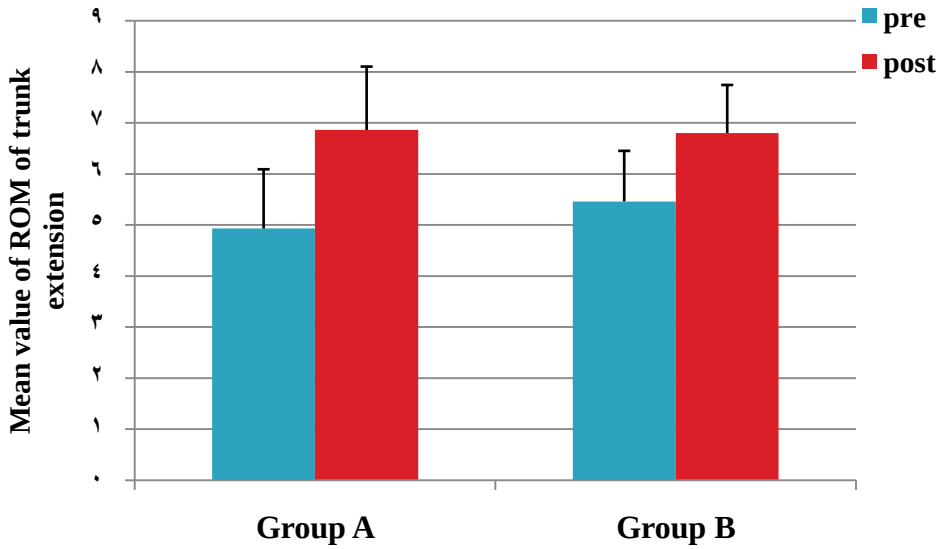
**5-Oswestry:**Post hoc tests revealed that the mean values of the pre" and "post" tests between group (A) and group (B)  showed there was no significant differences



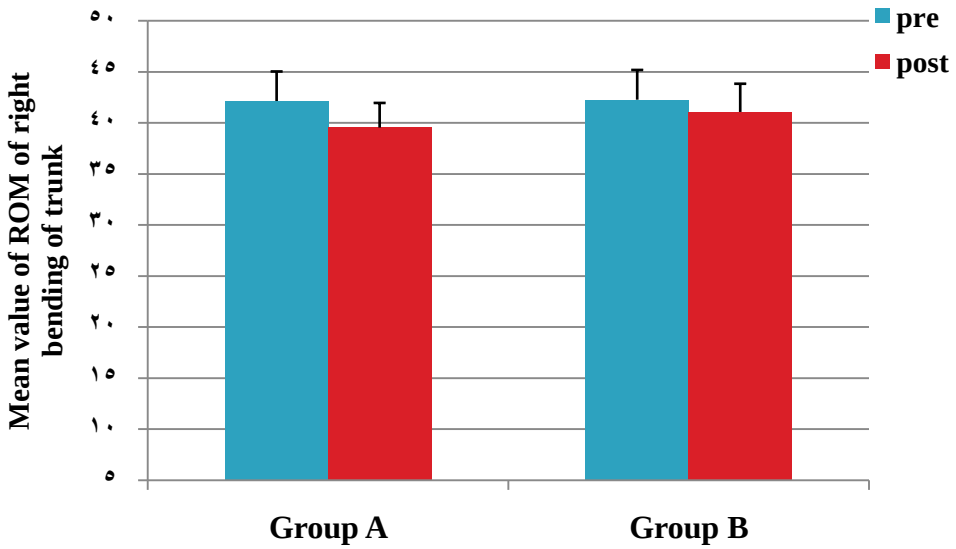
**6-ROM of trunk flexion :** there was no significant differences between group A and groupB



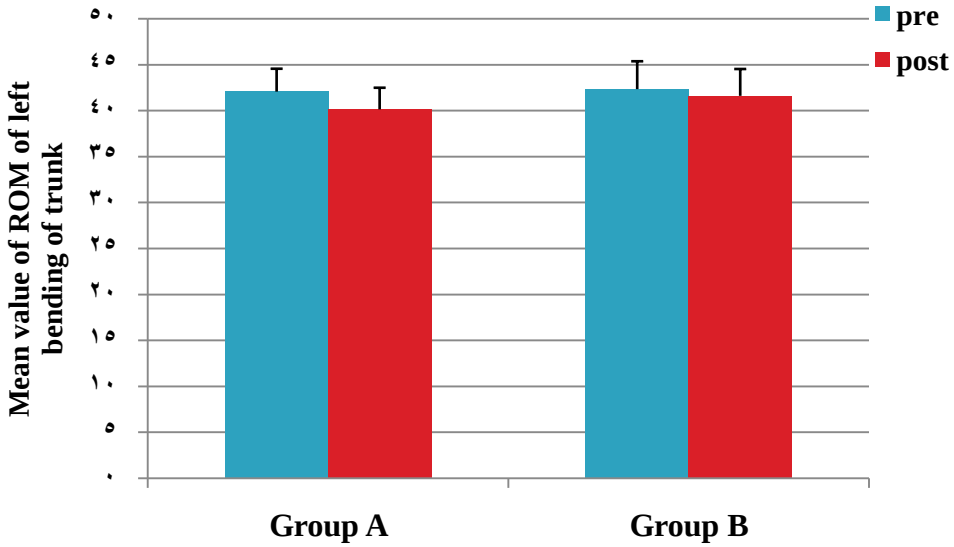
**7-ROM of trunk extension:**there was no significant differences between  group A and groupB



**8-ROM of right bending of trunk**:there was no significant difference between group A and group B



**9-ROM of left bending of trunk:**there was no significant difference between group A and group B



# CHAPTER V
# DISCUSSION

- Pain, functional disability, range of motion (flexion, extension, Rt side bending and Lt side bending) of back, and Cobb angle were assessed before and after treatment in both groups
- All patients in both groups had symptoms of back pain. This agrees with **(Weinstein et al., 2008),** who reported that scoliosis lead to disability from back pain during bending, twisting, lifting, prolonged sitting and standing.

**A-Kinesio taping& exercise:G1**

- **1-pain severity:**results showed a highly significant decrease in back pain at the end of treatment program. This results come in agreement with (**Marcin et al.,2012)** who stated that, Kinesio Tape is one of the methods which, not only have a positive influence on the stabilization , but also has a painkilling effect

- **Thelen et al.,(2008)** also were agreed and refers to this theory in their work on KT applications in shoulder pain. Also, **(Gonz´alez-Iglesias et al. 2009)** achieve pain-relief effects of KT applications in patients with acute whiplash injury. Research results confirm the positive influence of KT on the decrease in pain perception resulting in a lower intake of painkilling tablets (**Marcin et al.,2012).**

2. **Functional disability:**comparison between pre and post results of functional disability of group A there was highly significant decrease in functional disablity This results come in agreement with **(Castro-sanchaz et al., 2012)** as they stated that people with back pain who received kinesio taping have been achieved a significantly greater reduction in disability and improvement of functional endurance of the trunk muscles

3. **Range of Motion (ROM)**:Concerning back range of motion, there was significant increase of back (ROM) after treatment of patients by application of kinesio tape. These result come in agreement with **(Goo,2001; Halseth et al., 2004; Maruko 1999; Murray and Husk 2001; Ogura 1998; Oliveria 1999; Vochies 1999; Wallis 1999; Kase 1994; Kase et al. 2003).** Who stated that Kinesio tape, an alternative taping technique, has been theorized to improve a variety of physiological problems, including the range of motion, based on the functions of the tape **(Kase 2001; Kase et al. 1996; Garcia 2001).**

**B. Exercises Program (G2)**:

- **1. Pain Severity:** there was a decrease in back pain Both flexion and extension exercises help in relieving pain, this agree with **Elnaggar et al. (1991)** who reported that both the spinal flexion and extension exercises provided significant reduciton in LBP severity in chronic mechanical low back pain
- These result agree with **(suni et al.,1998)** who stated that low level of exercise for the back were associated with back disfunction and pain wherease . exercises improve back function and decrease pain.

**2. Functional disability:**there was significant decrease of functional disability post treatment of the traditional program group. In which physical exercises prevents or reduces functional disabilities of the scoliotic patients **(Negrini et al.,1992; Negrini et al.,1996;Roach,1997;Negrini,1991;Cobb,1948)**

**Rainville et al., (2004).**said that the most obvious beneift of exercise is it,s ability to improve and maintain musculoskletal and cardiovascular function,exercise may be useful for improve back function for patients with mechanical low back pain

3. **Range of Motion (ROM):**there was a significant increase in back range of motion (flexion, extension, Rt side bending, Lt side bending) at traditional physical therapy program group. This finding suported by **(Rainville et al., 2004)** who found that stretching exercises can be used to eliminate impaired flexibilty and restore normal trunk range of motion.

- Strengthening exercises were more effective in improving back muscle strength, pain relief, functional ability,physical improvement and range of motion in patients with chronic mechanical low back pain through the evaluation of many previous randomized control trial studies**(Rie, 2006).**

4. **Cobb's Angle:** Concerning the Cobb angle in both groups (experimental A, control B), there was no improvement recorded between pre and post assessment.This result come in agreement with **(Weinstein et al., 2008),** who stated that no definite evidence has shown that physical therapy or bracing reduces the risk of curve progression, corrects the existing deformity, or decrease the need for surgery

- On the contrary,**(Scheier,1967)** who have suggested that it is even possible that the improved biomechanics of the spine scondary to exercise therapy might have acorrective effect on the growth**.**
- **Simon et al.,(2012).** Perform a literature review for assessing exercise therapy in adolescent idiopathic scoliosis and found that many studies reported “significant” changes in the Cobb angle after treatment, which were actually of small magnitude and did not take into account the reported inter or intra-observer error rate. these studies had poor statistical analysis and did not report whether the small improvements noted were maintained in the long term

## Conclusion

On the basis of the present data, it is possible to conclude that kinesio taping is effective with exercise program in reducing pain in patients with postural scoliosis, on the other hand functional disabilities and back range of motion were improved but not reach statistically significant difference so they need further studies in addition there was no change in cobb angle after treatment in both groups.

**Recommendation**

- Studying the efficacy of kinesio taping in the treatment of the other degrees of cobb angle in scoliotic patients.
- Studying the efficacy of kinesio taping in the treatment of scoiosis with extending the treatment period, that may has an effect on cobb angle.
- Further studies are needed to compare between kinesio taping and other physical therapy modalities in treatment of postural scoliosis.

## Acknowledgment

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# DEDICATION

**Special Dedication**
**To My lovely Mother**

Thank you