بسم الله الرحمن الرحيم

EFFICACY OF KINESIO TAPING IN CONTROLLING GENU RECURVATUM IN DOWN SYNDROME CHILDREN

تأثير شريط الكينسيو فى التحكم بالركبة الطرقاء عند أطفال متلازمة داون

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Special and deepest thanks for my mother the most beautiful and strongest woman who always supports me, may god bless her

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Introduction

Down syndrome is a chromosomal disorder that is caused by the presence of all or part of an extra 21st chromosome. Down's syndrome provides a rare opportunity to explore relationships among genetic, structural, and cognitive or developmental abnormalities (Galante et al., 2009).

***Children with DS have the clinical signs of decreased resistance to passive movement and decreased tonic contraction of antigravity muscles and impairment of the ability to sustain postural control and movement against gravity, producing delay in motor development with* (Morgan, .(٢٠٠٩**

Down Syndrome hypotonia may results in many musculoskeletal and posture problems. Genu recurvatum is considered one form of these problems. Genu recurvatum is a hyperextension mal position between femur and tibia that can be considered considered as a common clinical presentation which places stress on the posterior surface of the knee (Llario et al., ٢٠٠٤).

Kinesio tape is the tape that has elastic properties, this property allows the tape to work with the soft tissue of the body versus restricting it, Kinesio taping provides protection and support for a joint while permitting optimal functional movement. The traction on the skin or the pressure of the tape provides cutaneous sensory cues, thus providing additional proprioceptive input to the central nervous system)David, .(٢٠٠٥

Purpose of the study

The purpose of the study will be:

To study the implication of kinesio taping in decreasing the angle of genu recurvatum in Down syndrome children.

Significance of the study

This study is to investigate the effect of kinesio taping in controlling genu recurvatum in Down syndrome children.

The intervention used in this study was designed to be used throughout the day and thus could be incorporated into many functional activities that the child encounters in everyday life. Genu recurvatum has been described as a chronic, perpetuating problem which tends to begin with a disorder of a small magnitude that exacerbates over time .

Using kinesio taping in early childhood Down syndrome children is a prophylactic method. That is help to prevent progression of genu recurvatum in walking stage that disturb balance and gait pattern and it also decreases energy expenditure .

Application of kinesio taping is easy way that can be learned and applied. It also used as a home program as it lasts for several days with application of ordinary physical therapy home program of these cases. The result will be beneficial to the therapists to use the ideal protocol to control genu recurvatum with similar conditions)Kase, .(٢٠٠٦

SUBJECTS, MATERIALS AND PROCEDURES

Subjects

Study Group: Consists of 15 Down Syndrome children who received a selected physical therapy program while applying kinesio taping to the knee joints.

Control Group: Consists of 15 Down Syndrome children who received the same physical therapy program given to study group.

Inclusion criteria

- Their chronological age ranged from (2 – 4years).
- The degree of genu recurvatum is grade 5 and 6 according to Kamila rasova scale.
- They were able to stand with assistance according to gross motor functional development scale (GMFM-88). And ranged between level I and level III.
- All children demonstrated genu recurvatum up on observational standing posture.
- They all wear ankle foot orthosis or medical shoes during assessment and treatment sessions.

Exclusion criteria

- Skin hyper sensitivity to the skin plaster application.
- Deformities as (club foot, congenital hip dislocation).
- Neurological or neuromuscular disorders rather than DS.

Materials

A) For evaluation:

1- Kamila rasova scale.

To evaluate the stability of joint function.

2- Gross Motor Function Measure (GMFM-88).

Is evaluative measure for assessing the changes over time in the gross motor function of children.

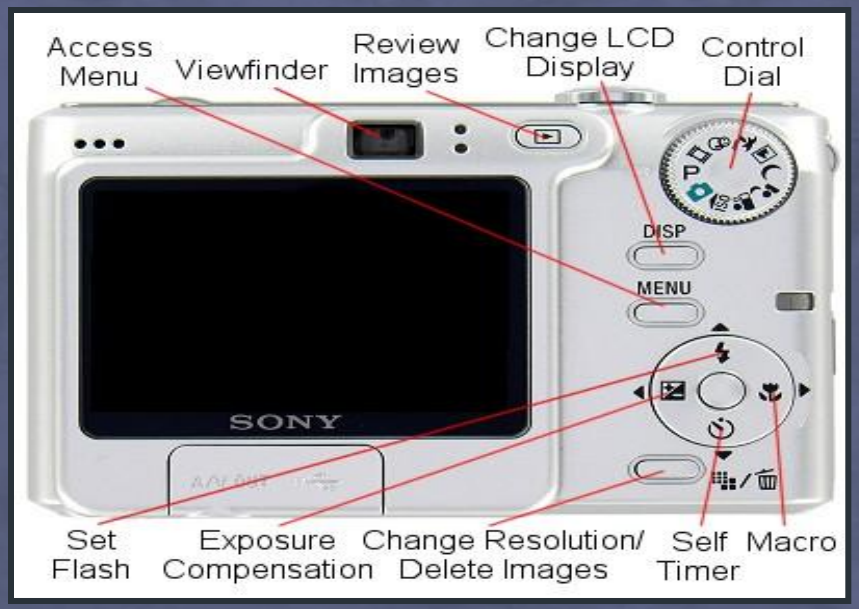
3- Photo procedures:

A- Circular Markers.

they were used to detect the bony landmarks for lower limb joints

Circular markers (Planet ® Luniversoufficio)

B) Digital camera



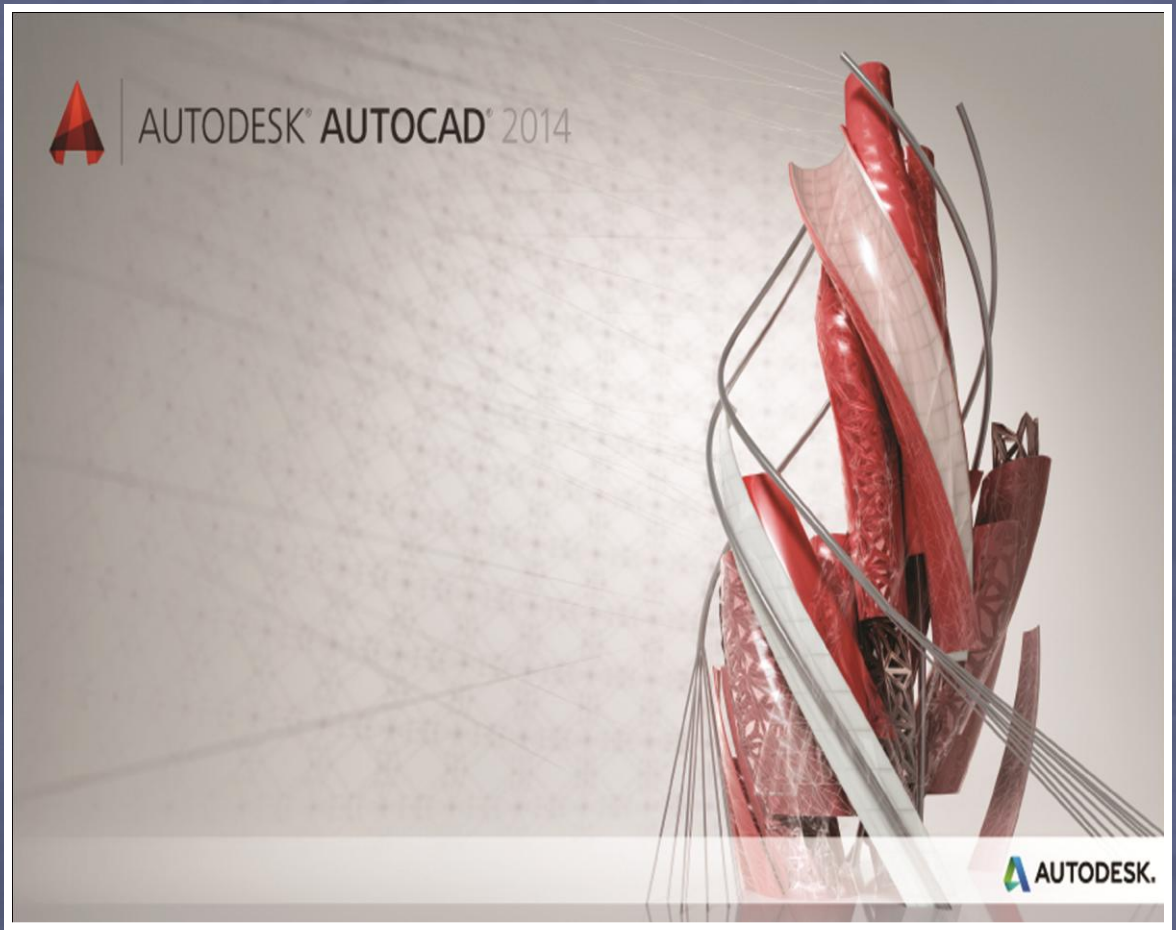
Front of the camera

Back of the camera

C- Computer System

AUTOCAD Program

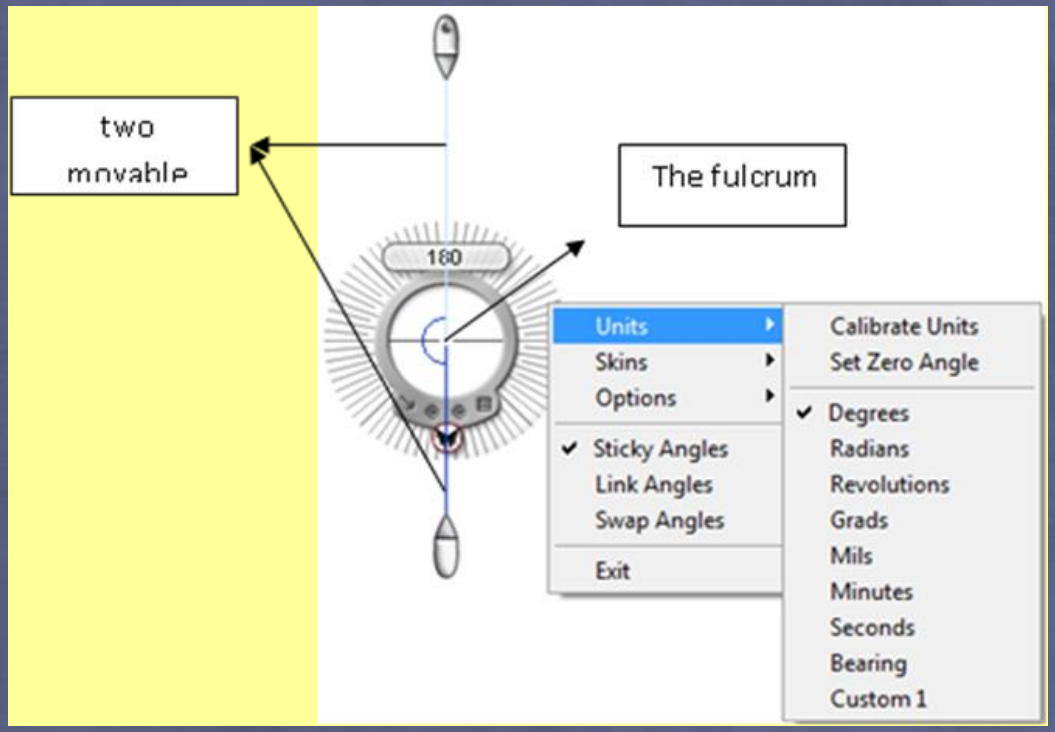
It was a program that was used for detection of joint angles through drawing lines parallel to body bones axis.



AUTOCAD, 2014

-Screen Protractor

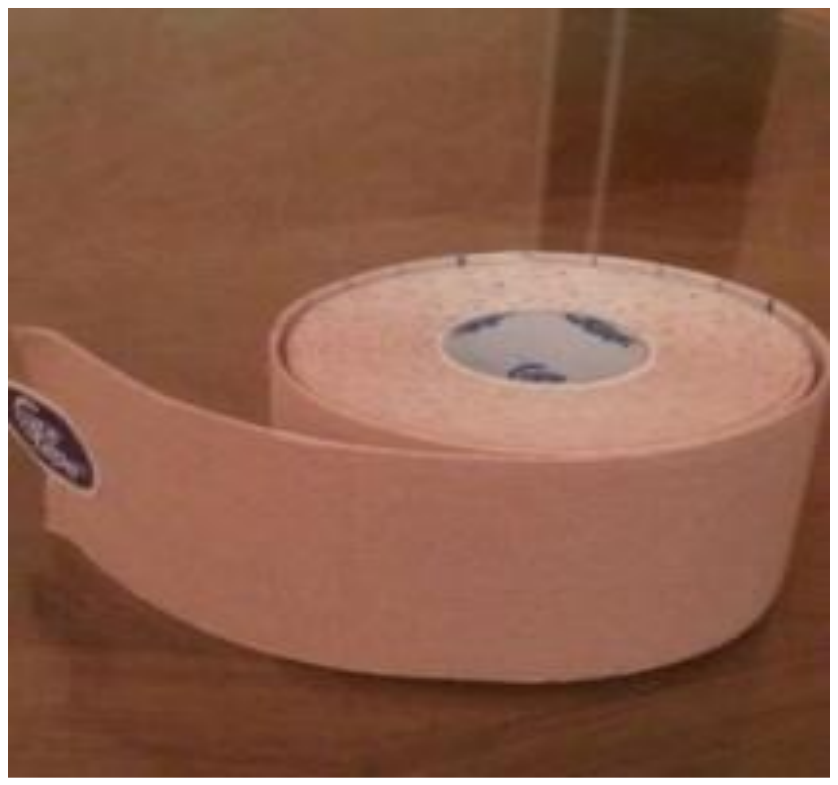
Used to measure joints angle by placing the fulcrum and two movable arms



Screen protractor

B) For treatment

1- Kinesio Taping

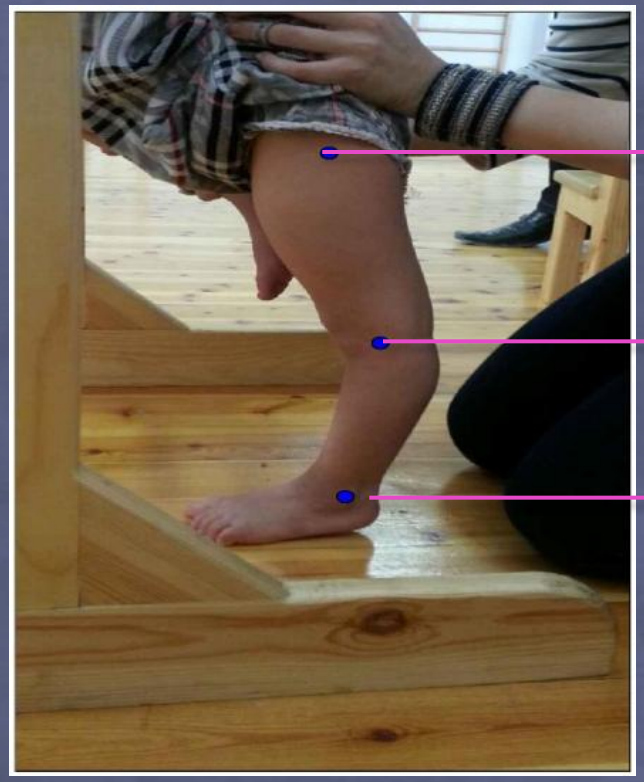


2- Instrumentation for physical therapy program

1. Mat
2. Wedge
3. Step
4. Balance
5. Stand
6. Small chair
7. Afo with shoes
8. Weight

Procedures

Circular markers placement



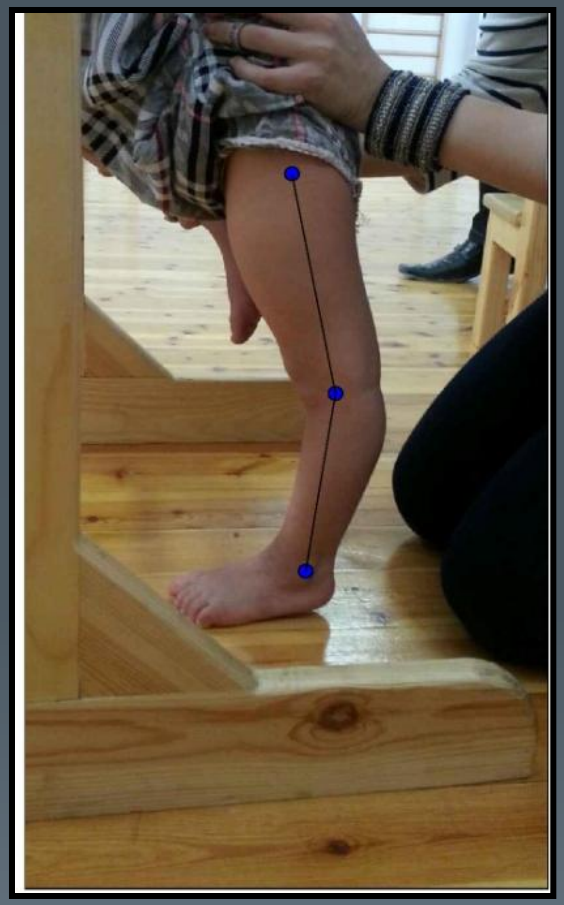
Greater trochanter

Lateral articulation of knee

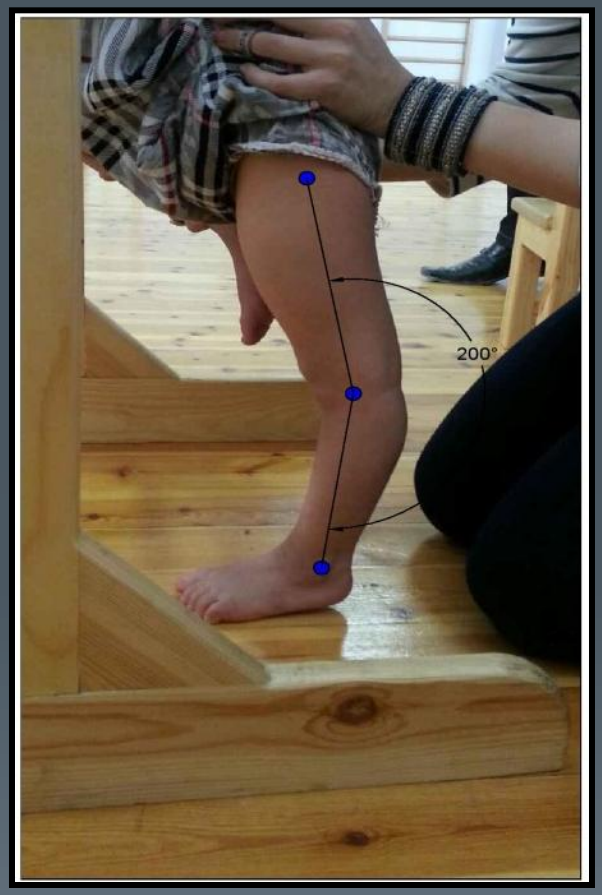
Lateral maleolus

Circular markers placement on lower extremity

Measurement of knee joint angles by AutoCAD

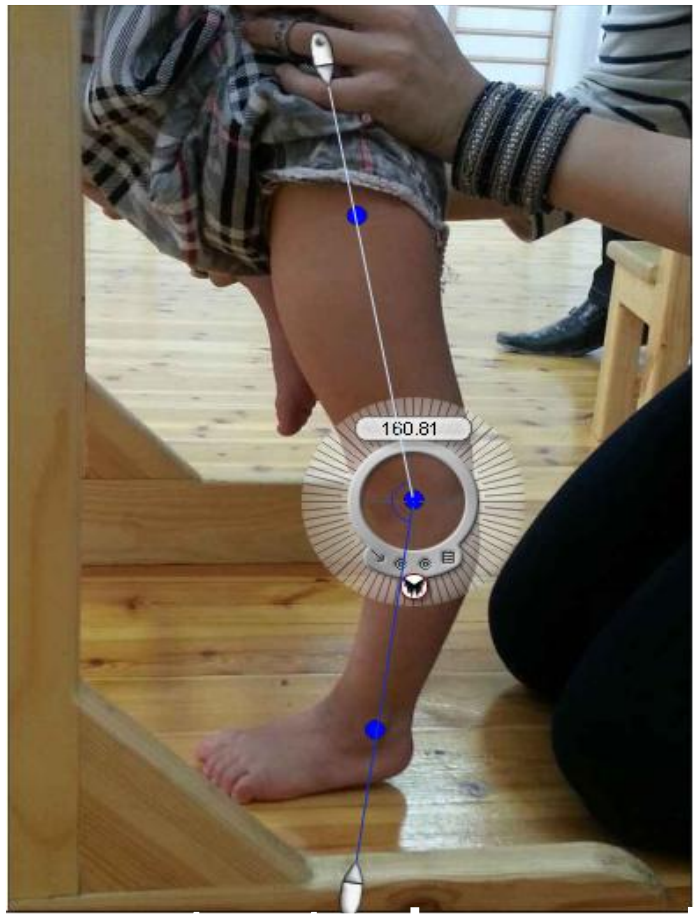


AutoCAd drawing lines



AutoCAD knee angle

Computerized Screen Protractor

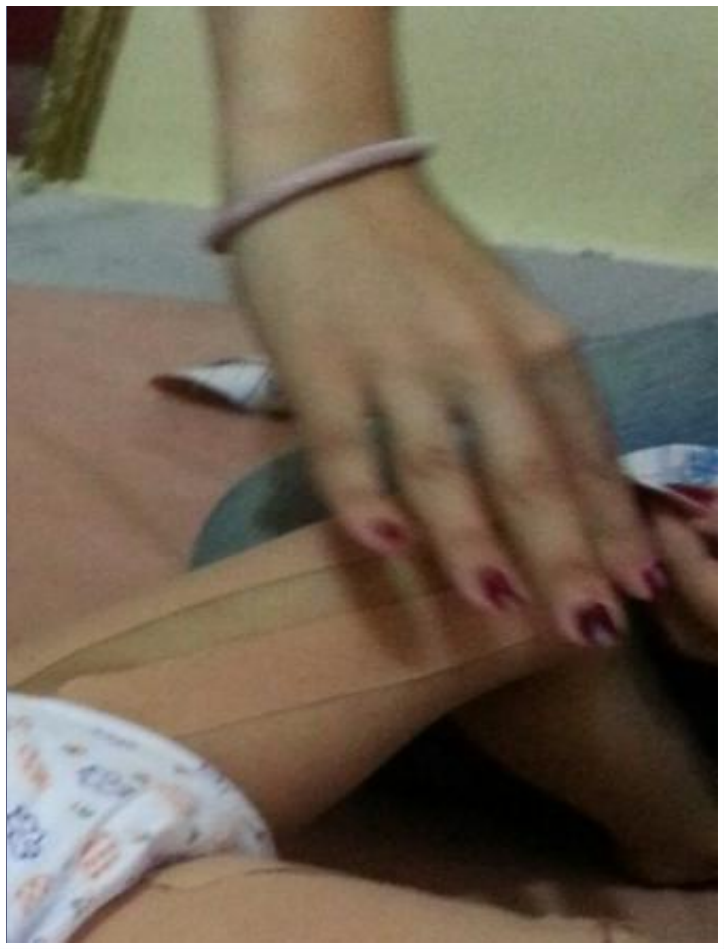


Screen protractor knee angle

Kinesio tapping Application

1. Stretch the tape away from anchor (portion with no tension) and the tail (portion with tension) will recoil back to anchor.
2. In the case when there is an anchor on both ends, stretch both anchor away from the middle. The tape will recoil back to middle.
3. To encourage shortening of muscle to facilitate, tape origin to insertion. To encourage elongation of muscle to inhibit tape insertion to origin.
4. Start the anchor in direction you want the lymphatic to flow (Kase et al., 2006)

Applying I band strip
on rectus femoris



Applying I band strip
on Vastus medialis

Applying I band strip on Vastus lateralis

Applying inverted Y shaped strip on hamstring

Physical therapy program for both groups:

1- Standing holding on the stand bar.

Standing holding stand bar

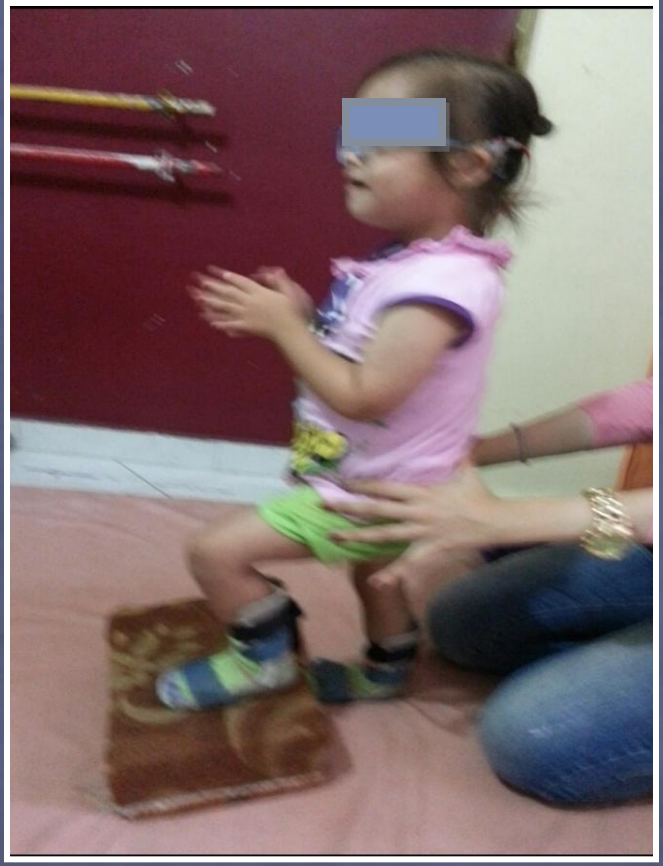
2- Standing against the wall.

Standing against wall

3- Stride standing:

Stride Standing

4- Step standing



Step standing

5- Standing on the balance board

Standing in balance board

6- Changing positionsd

From squatting to standing

Squatting exercise

From half kneeling to standing

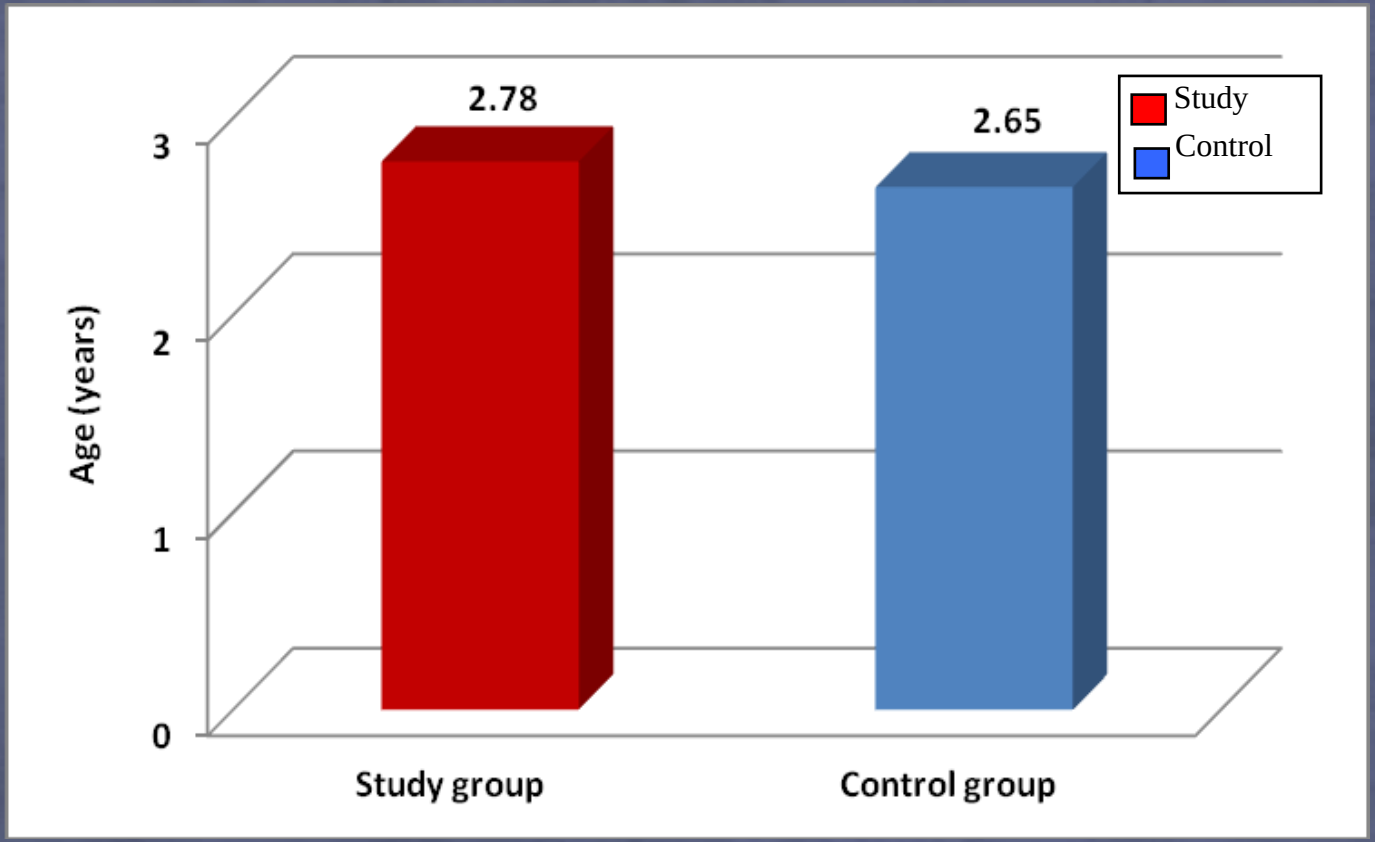
Half kneeling exercise


RESULTS

Table : Descriptive statistics and t-test for comparing the mean age of study and control groups

	Study group	Control group
$\bar{x}$ ± SD	2.78 ± 0.36	2.65 ± 0.38
Minimum	2	2.1
Maximum	3.4	3.3
MD	0.13	
t-value	0.97	
p-value	0.33	
Significance	NS	

There was no significant difference between both groups in the mean age values (p = 0.33) .

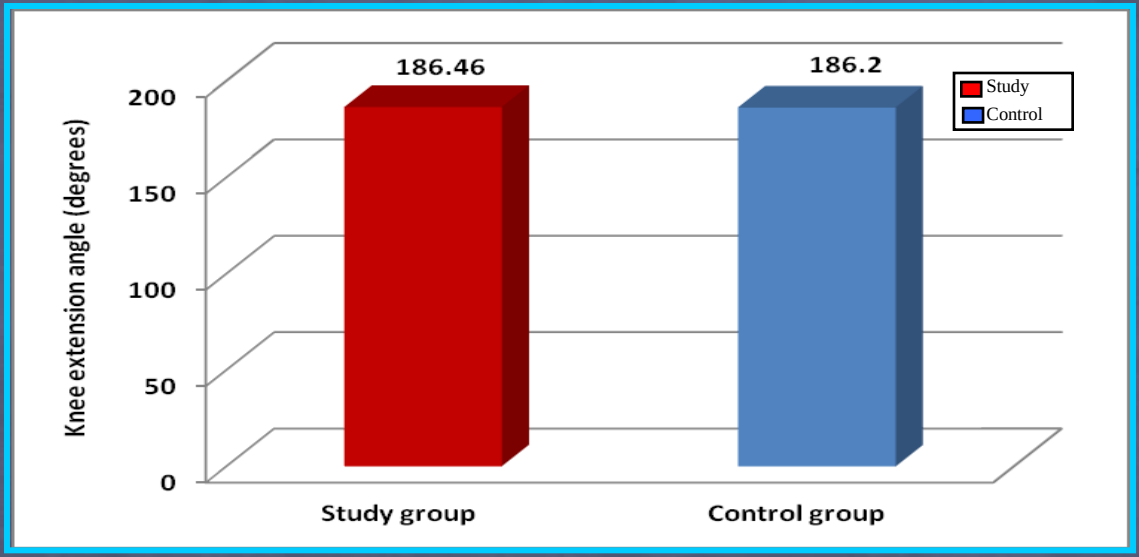


Mean age (years) of study and control groups.

Comparison between groups pre treatment

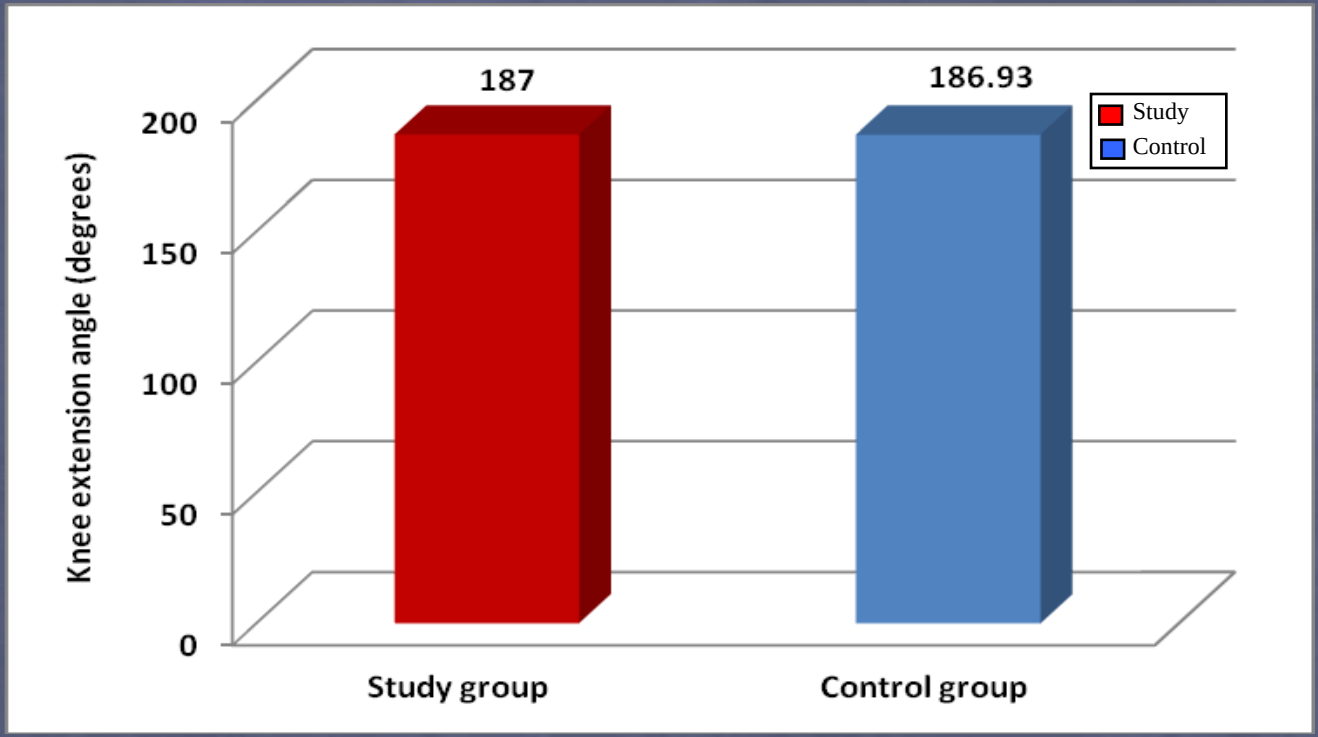
I. Pre treatment mean values of knee extension angle measured by AUTO -CAD program of both groups (study and control).

There was no significant difference in the mean values of knee extension angle (p = 0.89).



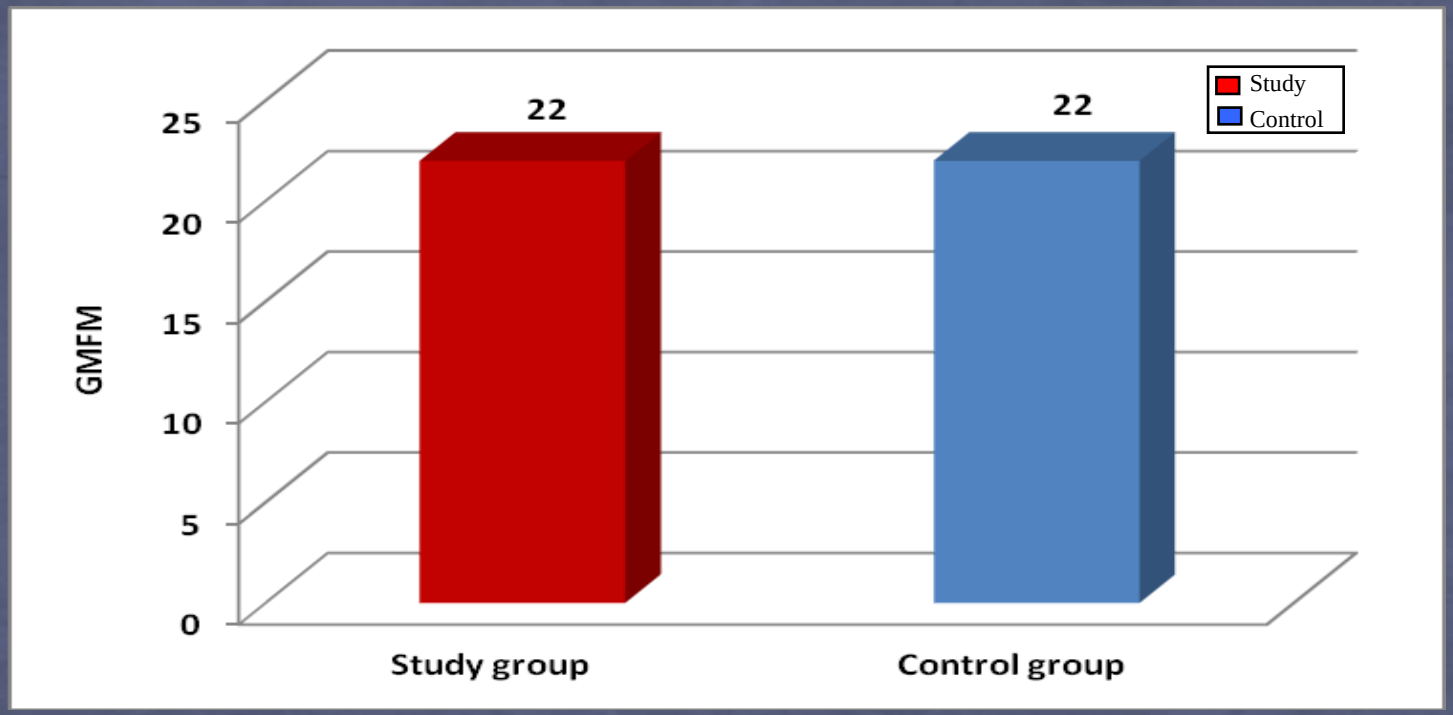
II. Pre treatment mean values of knee extension angle measured by computerized screen protractor of both groups (study and control):

There was no significant difference in the mean values of knee extension angle ((p = 0.97) .



III. Pre treatment median values of GMFM of both groups (study and control groups.)

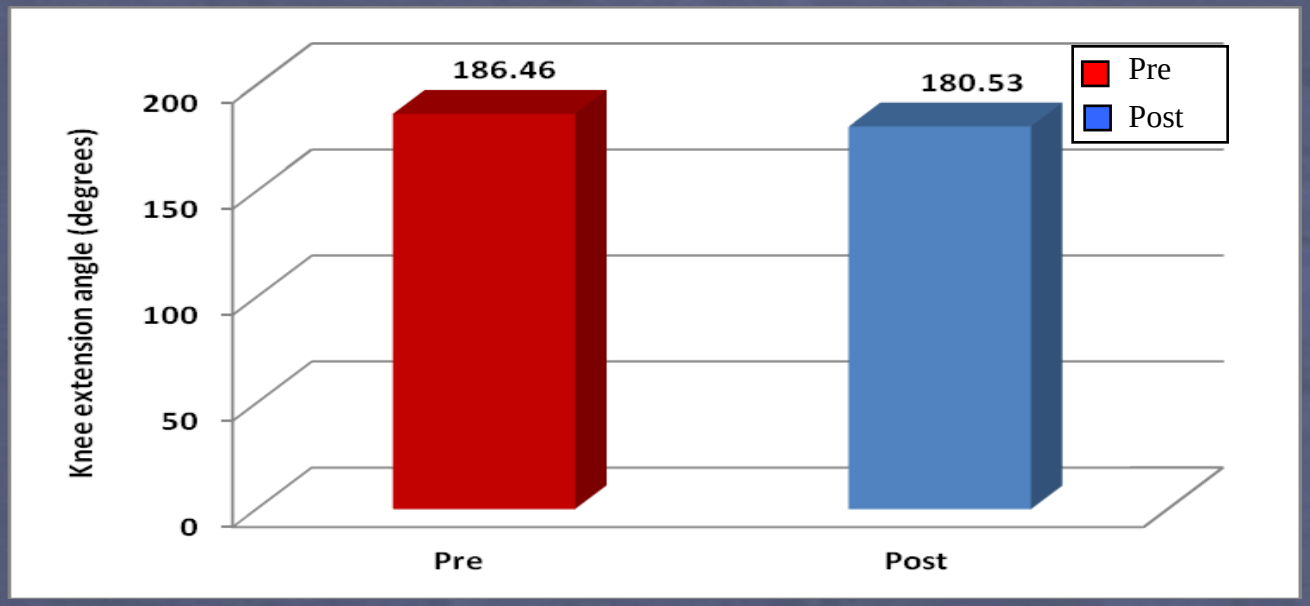
There was no significant difference in the median values of GMFM (p = 0.96).



Results of study group

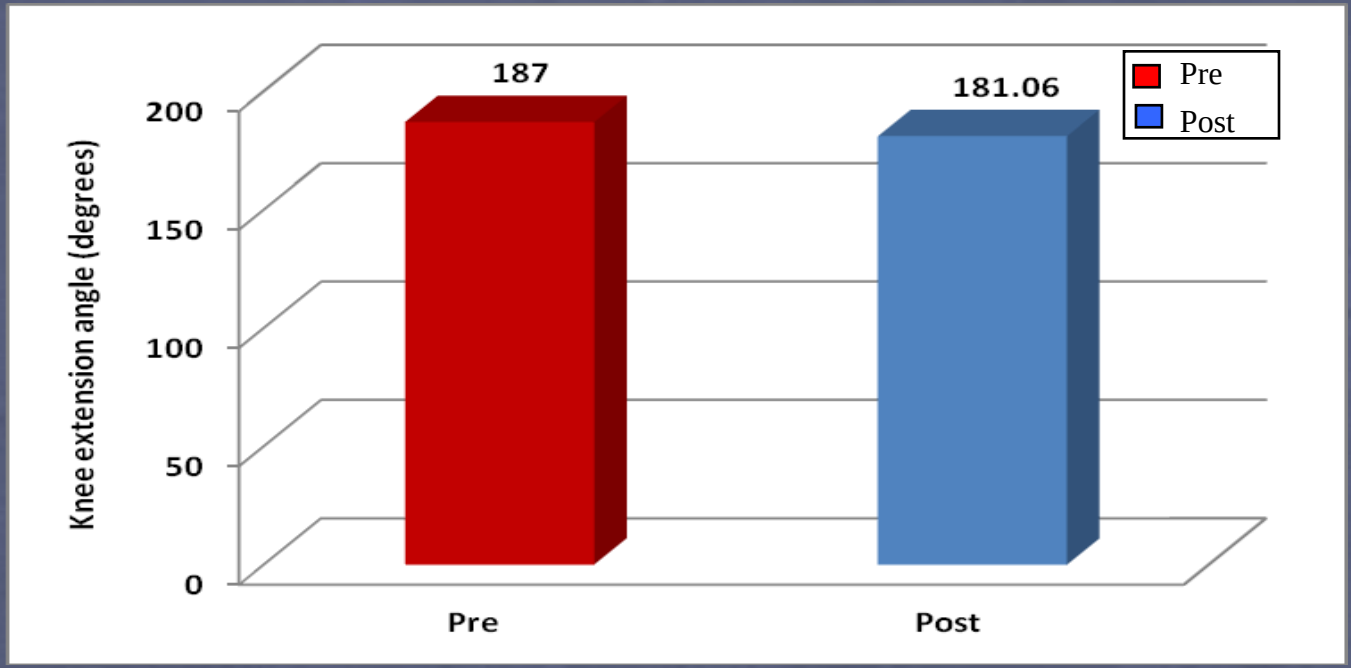
I. Pre and post treatment mean values knee extension angle measured by AUTO -CAD program of study group.

There was a significant decrease in the mean values of knee extension angle (p = 0.0001).



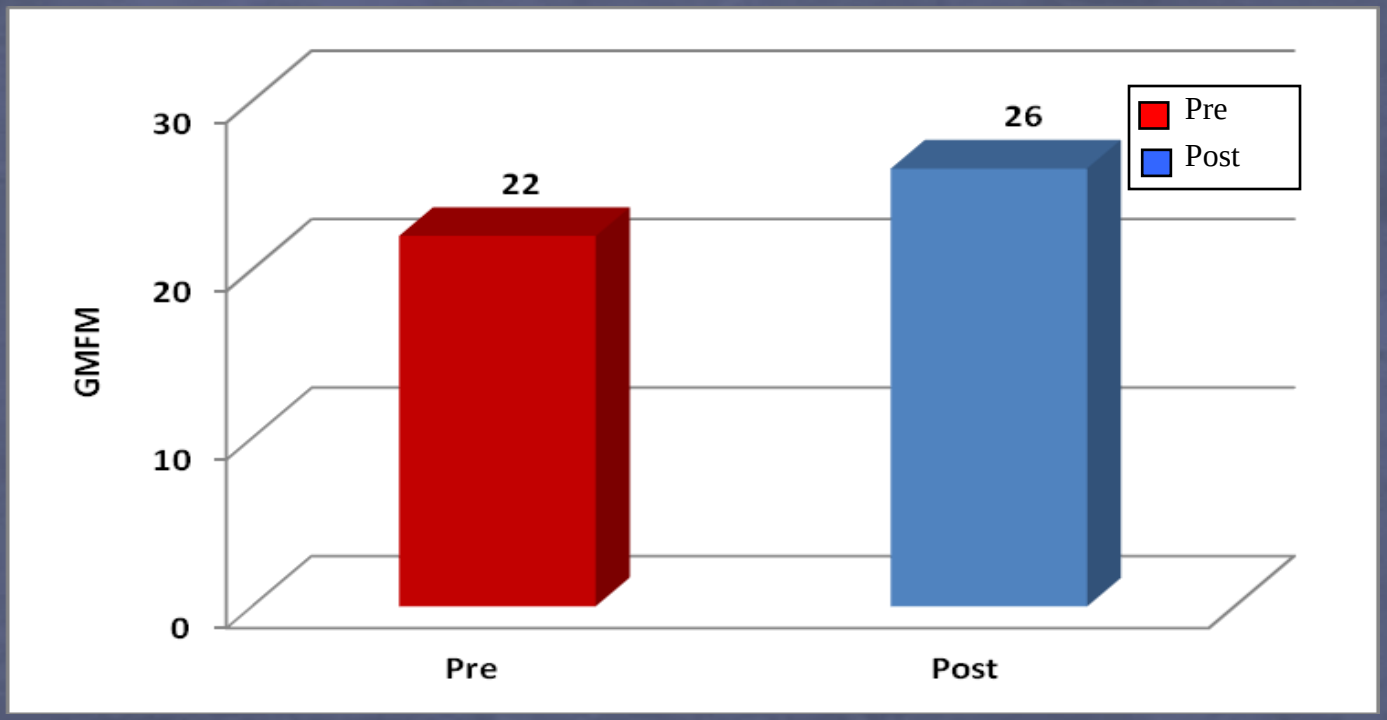
II. Pre and post treatment mean values knee extension angle measured by computerized screen protractor of study group

There was a significant decrease in the mean values of knee extension angle (p = 0.0001).



III. Pre and post treatment median values of GMFM of study group

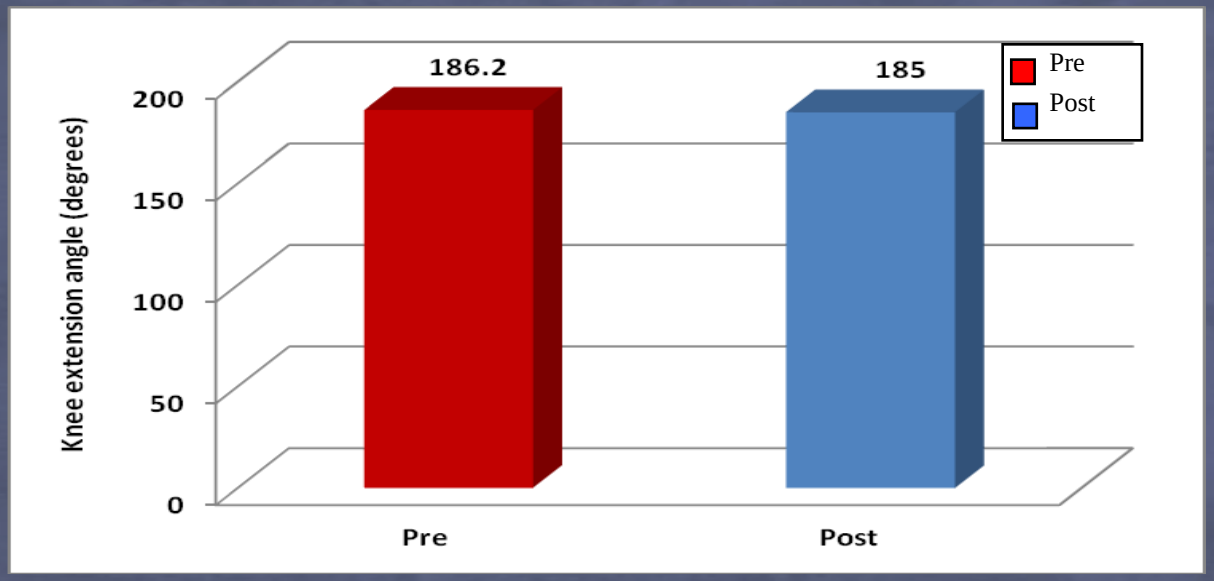
There was a significant increase in the median values of GMFM (p = 0.0001).



Results of control group

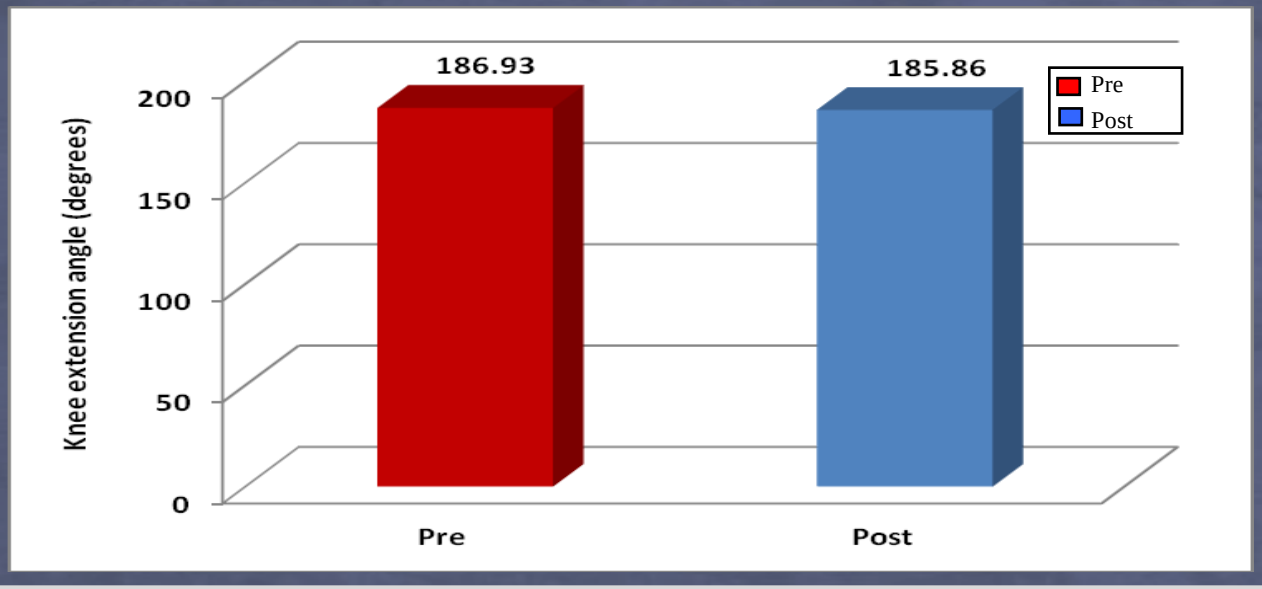
I- Pre and post treatment mean values knee extension angle measured by AUTO -CAD program of control group.

There was a There was a significant decrease in the mean values of knee extension angle (p = 0.0001).



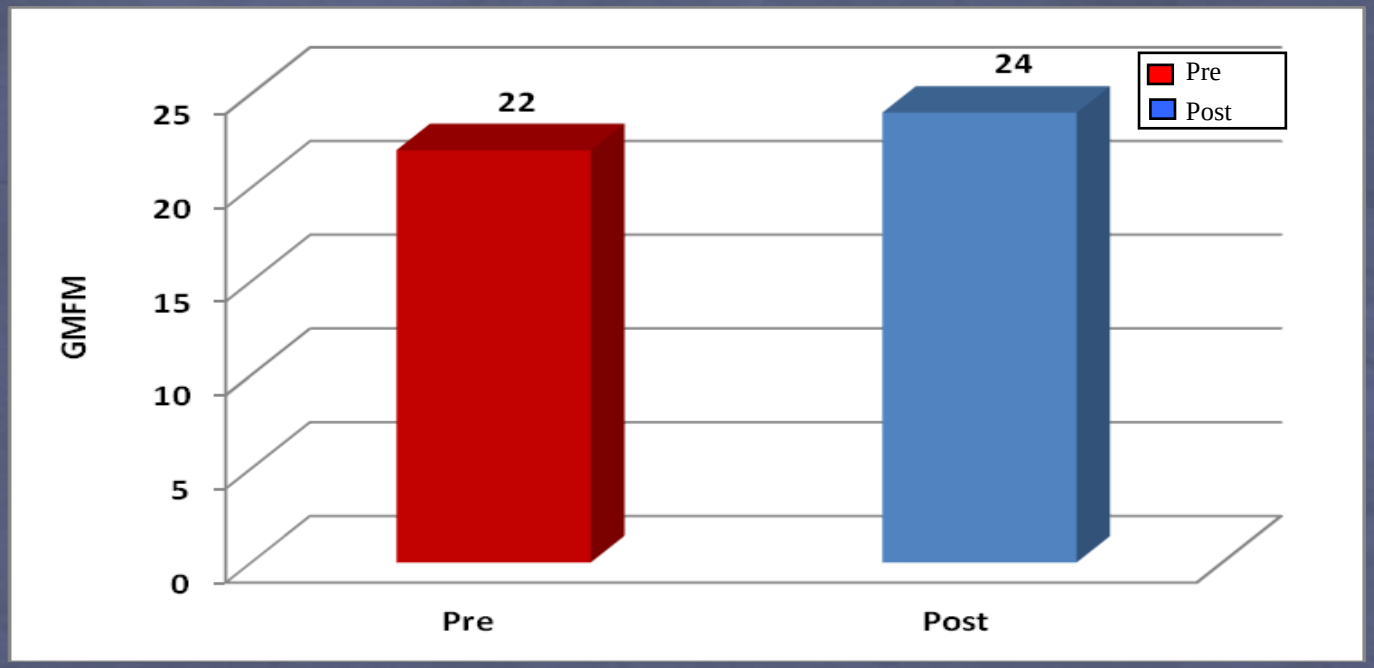
II. Pre and post treatment mean values knee extension angle measured by computerized screen protractor of control group.

There was a significant decrease in the mean values of knee extension angle (p = 0.0001).



III. Pre and post treatment median values of GMFM of control group.

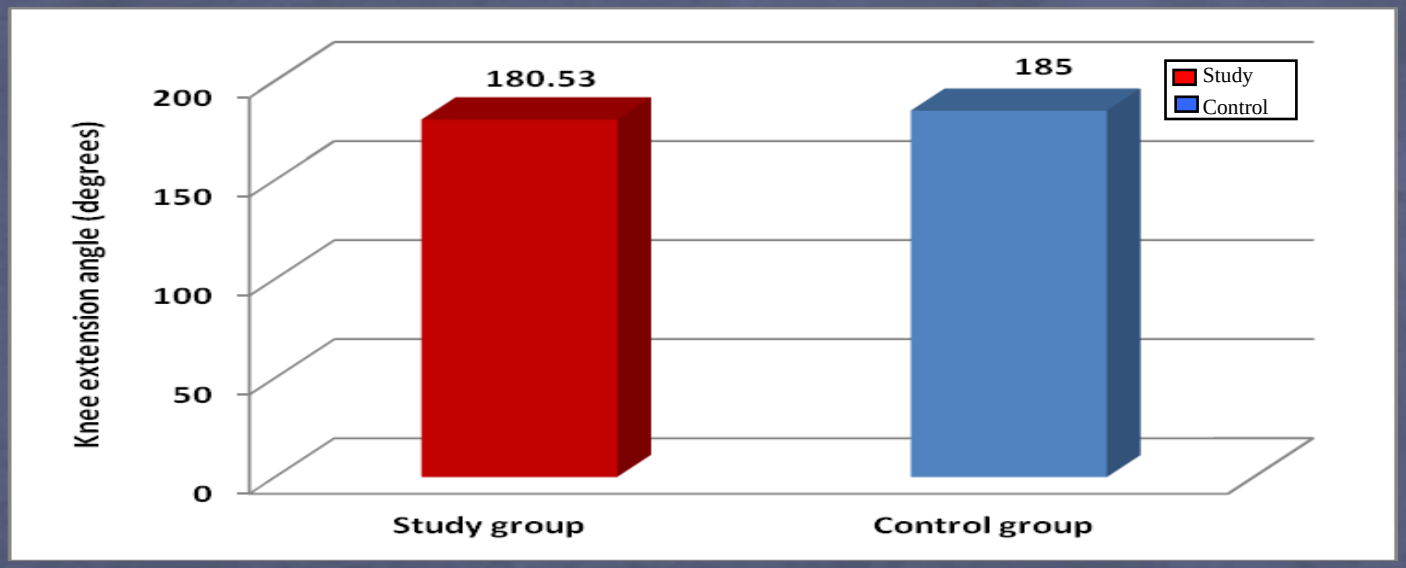
There was a significant increase in the median values of GMFM angle (p = 0.001).



Comparison between groups post treatment

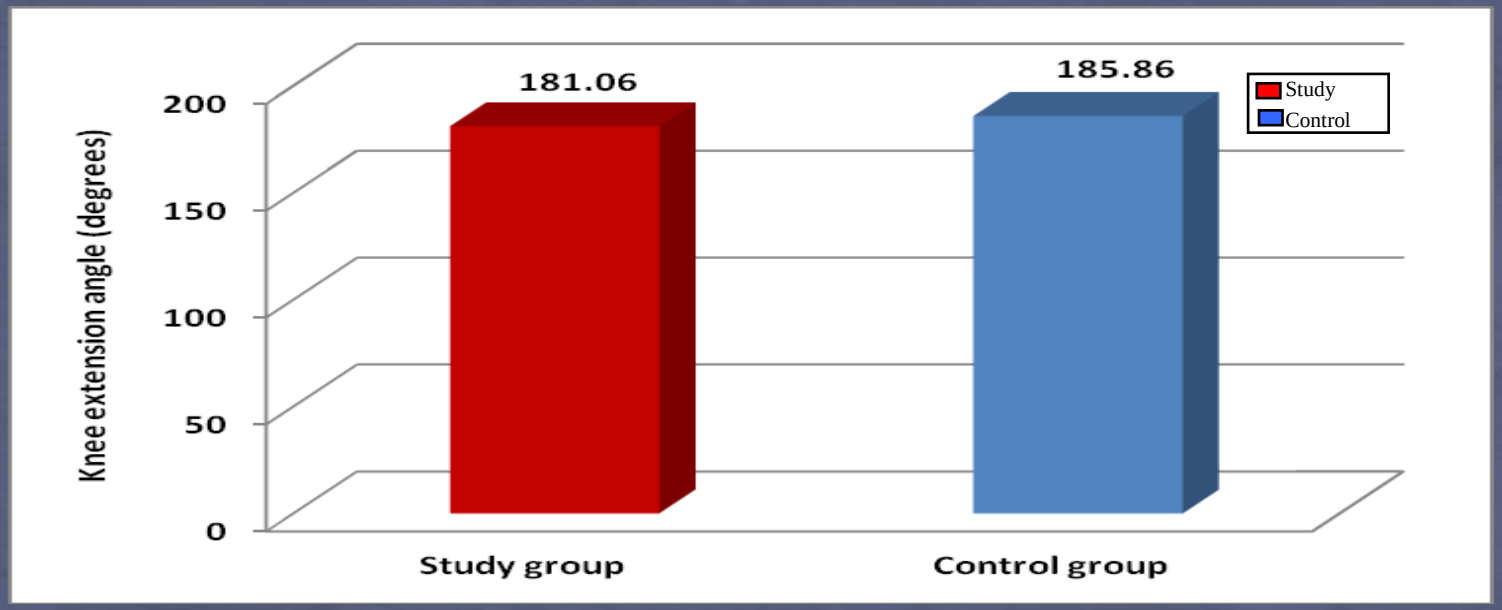
1- Post treatment mean values of knee extension angle measured by AUTO -CAD program of both groups (study and control)

There was a significant decrease in the mean values of knee extension angle (p = 0.03).



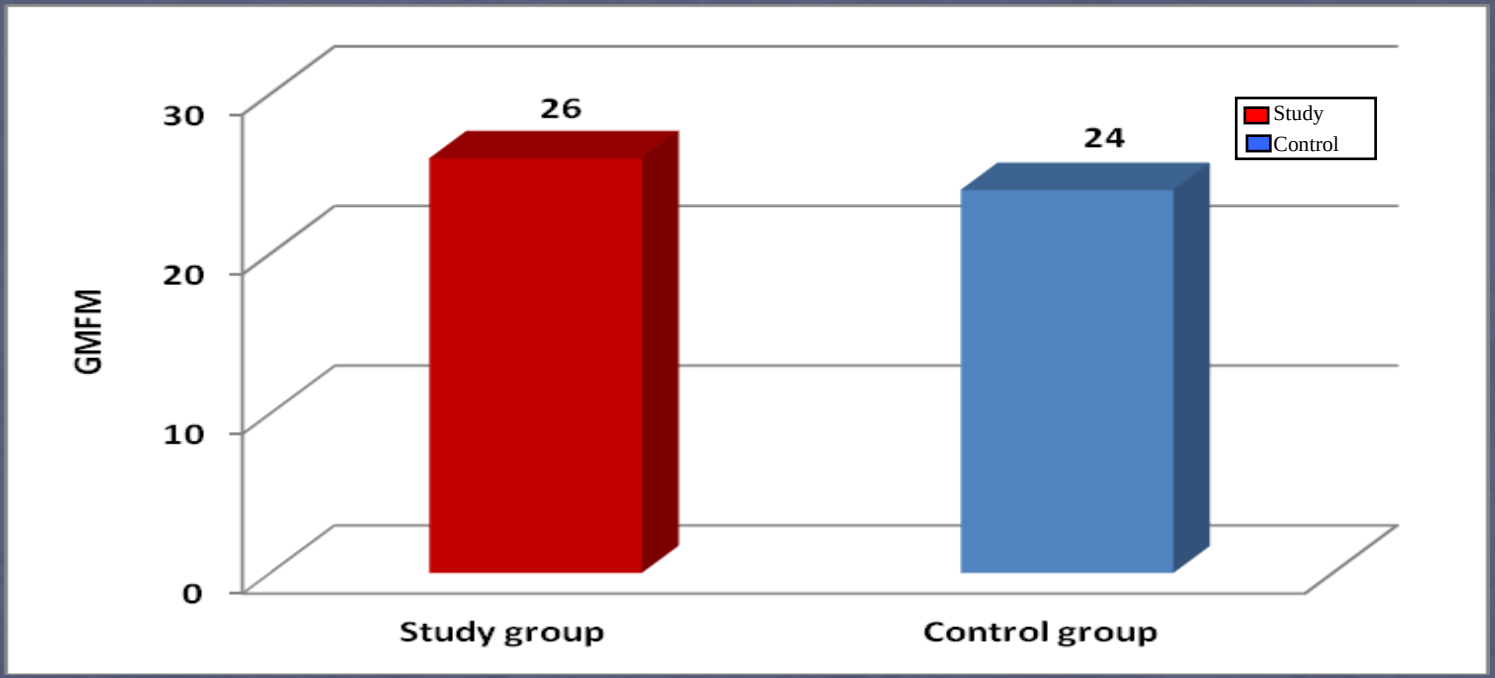
II. Post treatment mean values of knee extension angle measured by computerized screen protractor of both groups (study and control).

There was a significant decrease in the mean values of knee extension angle (p = 0.006).



III. Post treatment median values of GMFM of both groups (study and control groups).

There was a significant increase in the median values of GMFM (p = 0.03).



DISCUSSION

The result of this study come in agree with the finding of Spanos et al. (٢٠٠٨) who found that the application of kienesio tape support knee joint and prevent further injury by enhancing proprioceptive acuity via the activation of the skin proprioceptive receptor of the surrounding area in children

Also the current study support the findings of, Slupik et al. (2007) who found that increased recruitment of muscle's motor units, 24 hours after placement of KT on the quadriceps muscle. The tape was intended to increase the tone of the medial head of the quadriceps muscle, thus started at the origin of the vastus medialis muscle ending at the muscle's insertion at patellar ligament. Transdermal EMG was used to assess the bioelectrical activity of the muscle, measuring the peak torque of the vastus medialis oblique (VMO) muscle.

Study by Vithoulka et al. (2010) found significant statistical increase in peakmuscle torque during eccentric contraction of the quadriceps musculature with kinesio tape application compared to placebo tape.

On the contrary these results disagree with Macdonald et al., (2004) who found that stretch tape could not give mechanical support to ligament , but may be used in conjunction with rigid tape to give added support.

This significant improvement of genurecurvatum could also be attributed to the combination between physical therapy program and kinesio tape application as the effect of kinesio tapping method on the contraction of muscle is dependent on the direction on which it is applied. The basic principle of therapeutic tapping for weakened muscle is to apply the tape to the affected muscle. Starting from where the muscle originates continuing along the muscle, and finishing at the muscle insertion. This results in enhancing the contraction **(Hammer, 2007)**.

The significant improvement of the gross motor abilities (standing domain) may be attributed to the improvement of muscle strength by strengthening exercises. This explanation matches the finding of (Beckung, 2008) who found that there was a significant difference in muscle strength between GMFCS levels. There was also positive correlation between muscle strength and the GMFM, indicating that muscle weakness affects standing and walking abilities.


CONCLUSION

From the obtained results of this study, it could be concluded that kinesio taping is effective in controlling genu recurvatum in Down syndrome children


RECOMMENDATION

According to the result of this study, we recommend the following:

1. Further studies should be done using larger samples to be able to generalize the obtained findings.
2. Other study should be done to compare the effect of the knee cage effect of kinesiotape on genu recurvatum in Down syndrome children.
3. Follow up study to investigate the Down Syndrome children conditions after (3-6) months of kinesio taping use on genu recurvatum.
4. Other study should be performed to assess the correlation between trunk flexion and genu recurvatum control.
5. Similar study should be done on older children of Down syndrome to assess genu recurvatum while walking with analysis of gait parameters


Thank You