



## Effect of Kinesio taping as an adjunct to strengthening exercises in functional flat feet

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### **Abstract**

**Background:** Flat feet also known as pes planus or fallen arches. It is a condition in which medial longitudinal arch of the foot ,which runs lengthwise along the sole, is lowered or flattened out and this can be due to intrinsic muscle weakness , ligmentous laxity etc. The objective of the study is to see the effect of kinesio taping as an adjunct to strengthening exercises in functional flat feet aged 18 to 30 years individuals **Methods:** 30 students were selected according to inclusion criteria and divided into 2 groups. Group A received strengthening exercises and Group B received kinesio taping along with the strengthening exercises for 4 weeks. The values of navicular drop test were taken pre and post 4 weeks of treatment. Statistical analysis was done and results were tabulated. **Results:** Both the groups showed improvement in navicular height post treatment but more statistically significant result was found in the Group B individuals treated with kinesio taping along with strengthening exercises **Conclusion:** The study concluded that kinesio taping along with the strengthening exercises were found to be more effective on navicular height in functional flat feet aged 18-30 years.

### **Introduction:**

Flat feet also known as pes planus or fallen arches<sup>1</sup>It is a condition in which the medial longitudinal arch of the feet, which runs lengthwise along the sole of the foot is lowered or flattened out<sup>1</sup>The arch adds elasticity & flexibility to the foot by allowing the midfoot to spread and close. They help the foot to absorb and produce strength to push off in balance and walk<sup>3</sup>They also help distribute weight evenly around the foot and act as a energy store when running.<sup>3</sup> Two Types of flat feet Rigid/ Structural and Flexible/ Functional flat feet: If medial longitudinal arch is restore in standing as compared to sitting position CAUSES FOR FUNCTIONAL FLAT FEET:Intrinsic muscle fatigue,Plantar Muscle weakness ,Ligament hypermobility Obesity ,Inappropriate footwear There are Biomechanical changes occuring in flat feet:<sup>3</sup> i.e. Eversion of calcaneus in relation to talus and Medial rotation of navicular bone .

- Flat feet has complications like plantarfascitis, Tibialis posterior tendenopathy & dysfunction, Achillis tendenopathy, Hallux valgus, Metatarsalgia, Balance impairment.<sup>1,4</sup> In 2013,it is proved that strengthening exercises of plantar intrinsic has an effect on medial longitudinal arch morphology and dynamic function<sup>5</sup> .KENZO KASE, explained mechanism of effects of kinesio taping that; It alters muscle function; by acting on



weakened muscles, Decreases pain through neurological suppression , Repositioning of subluxed joints<sup>17</sup> .In 2016 study demonstrated that kinematic taping on flexible flat feet had positive effects of immediately reducing the abnormally increased foot pressure and the tone and stiffness in the lower extremity muscles So it is important to find out best treatment for correcting flat feet to avoid further complications .Hence, this study is intended to combine the effect of taping and strengthening exercises in flat feet.

**AIMS:**

- To study the effect of kinesio taping as an adjunct to strengthening exercises in functional flat feet

**Objectives:**

- To study the effect of strengthening exercises on navicular height in functional flat feet
- To study the effect of kinesio taping & strengthening exercises on navicular height in functional flat feet
- To compare the efficacy in two protocols

**Methodology and materials:**

- **Type of study:** Experimental study
- **Location of study:** Smt .Kashibai Navale Medical College Campus,Pune
- **Duration of study:** 6 months
- **Sample population:** Individuals having functional flat feet
- **Sample size:** 30
- **Sampling method:** Convenient sampling
- **Tool used in study:** Pen, Paper, Hard Ruler, Kinesio tape, Scissor

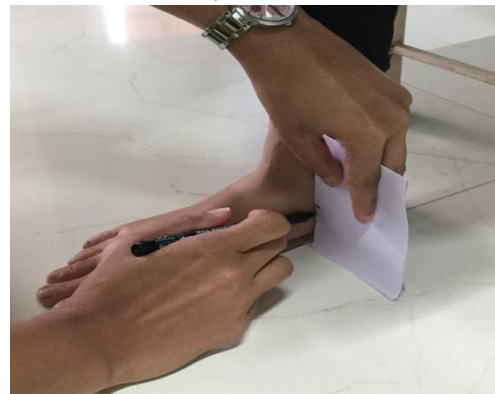




INCLUSION CRITERIA	EXCLUSION CRITERIA
➤ Functional flat feet	➤ Any lower limb injury
➤ Both male & female	➤ Healing fracture of lower limb
➤ Age: 18 to 30 years asymptomatic individuals	➤ Any neuromuscular disorder
➤ Navicular drop test positive: more than 10 mm of drop	➤ Recent surgery
	➤ Any open wound

**Outcome measure:**

- Navicular drop test: which measures the navicular height from the ground<sup>4</sup>
- RELIABILITY: Intra- and Inter-rater reliability (ICC = 0.83 to 0.95).



- To measure the navicular height, navicular drop test was performed with the help of a thick white index card. It was placed parallel to the subject's feet (maintained in a subtalar neutral position) inner aspect of the hindfoot, with the card placed from the floor in a vertical position passing the navicular bone. The level of the most prominent point of the navicular tubercle was marked on the card and the floor was measured during sitting and standing
- If navicular height is decreases by 10 mm in standing when compared to sitting position then individual is having functional flat feet and can be included in the study



• **Procedure:**

Permission was taken from:

a. The principal of SKNCOPT

.b .Ethical clearance committee

1 .Patient's written consent was taken.

2. Patients fulfilling the inclusion criteria was recruited In the study after taking a written consent.

3. Random allocation of participants was done using chit method into 2 groups:

A. Control group.

B. Experimental group.

4. Control group received strengthening exercises and the experimental group received strengthening exercises and kinesio taping

5. Navicular height was assessed pre and post treatment

Duration of protocol: 4weeks

**Conventional treatment for the control group was as follows:**

- Strengthening exercises

- Towel crawl

Repetitions for 1-2 min

Set:1



- Picking up small objects

Repetitions for 1-2 min

Set:1



- Abduction & adduction of digits

Repetitions:10(3-5sec hold)

Sets:2





- Great toe press  
Repetitions:10(3-5sec hold)  
Sets:2



- Small toe abduction  
Repetitions:10(3-5sec hold)  
Sets:2



- Piano key  
Repetitions For 3-5 min  
Sets:2



- Taping the toes  
Repetitions:20-25  
Sets:2





- Heel raises  
Repetitions:10 with 10 sec (each foot)  
Set:1



- Calf stretch  
Repetitions:2 with 30 sec hold on each side  
Set:1
- Total duration : 20 - 25 min
- 4 weeks strengthening protocol
- Measured navicular height after 4 weeks (post treatment)

**Experimental group received the following treatment:**

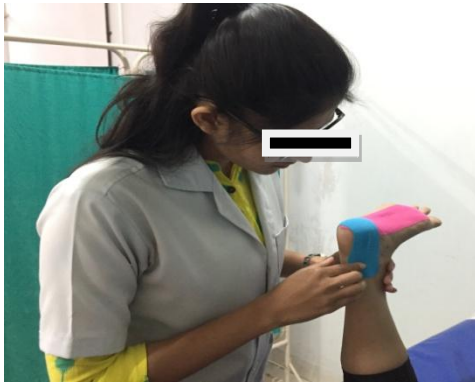
- a) Strengthening exercises as mentioned above
- b) Kinesio taping

**Procedure for application of kinesio tape:**

- Taping was administered for 15 subjects. The subject's skin was checked for sensitivity one day prior to the application of taping. A part of the tape was applied over the lower leg posterior aspect and next day the area was examine for irritability, redness and blisters only those nonallergic individuals are included for the study.
- Subjects were made to lie in the prone position with knee flexed at 90 degrees. Foot was placed in subtalar neutral position, minimal inversion and neutral dorsiflexion. Taping was done in prone with 4 "I" tapes, 2 inches wide.
- The first piece of tape was applied on the plantar aspect starting from metatarsal head to calcaneum



- The second piece of tape was anchored on the lateral midfoot and then diagonally under calcaneus and medially around posterior ankle. This piece of tape helped to maintain calcaneus in a more neutral position and limit calcaneal eversion.



- The third piece of tape was anchored on medial midfoot and brought diagonally under calcaneus and laterally around posterior ankle which assisted to “lock” calcaneus in position or “close the loop” for sensory input.



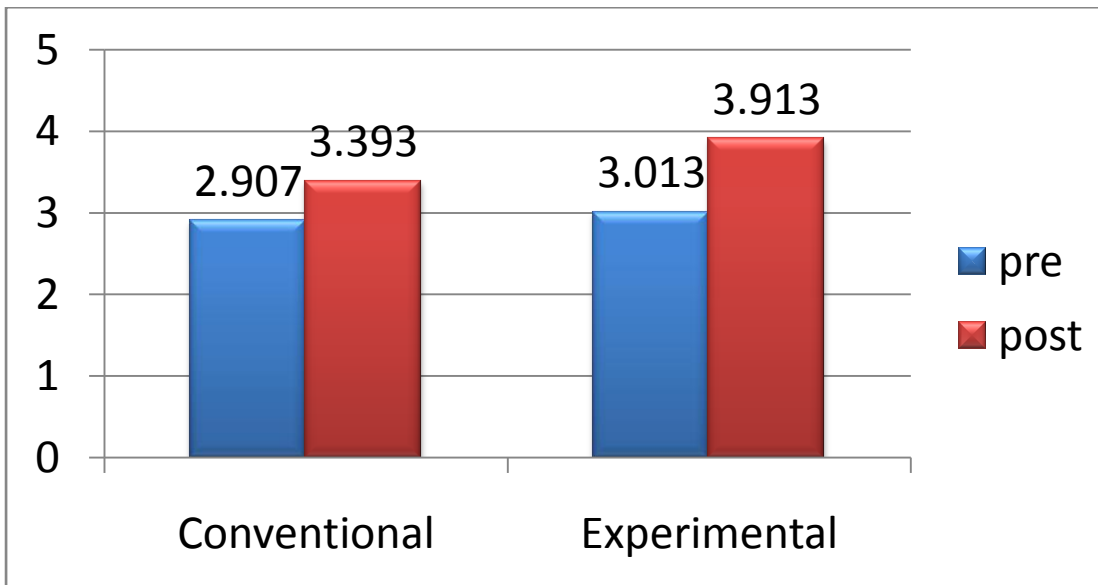
- The fourth piece of tape extended from the lateral midfoot, over navicular and up the medial distal third of the lower leg, just above the malleolus which supported the midfoot.



- Along with the taping, the patient was asked to do foot strengthening exercises for 4 weeks. The tape was changed every 5 days for 4 weeks.
- After completing the 4 weeks treatment protocol navicular drop test was performed

**Result:**

**Table 1.**



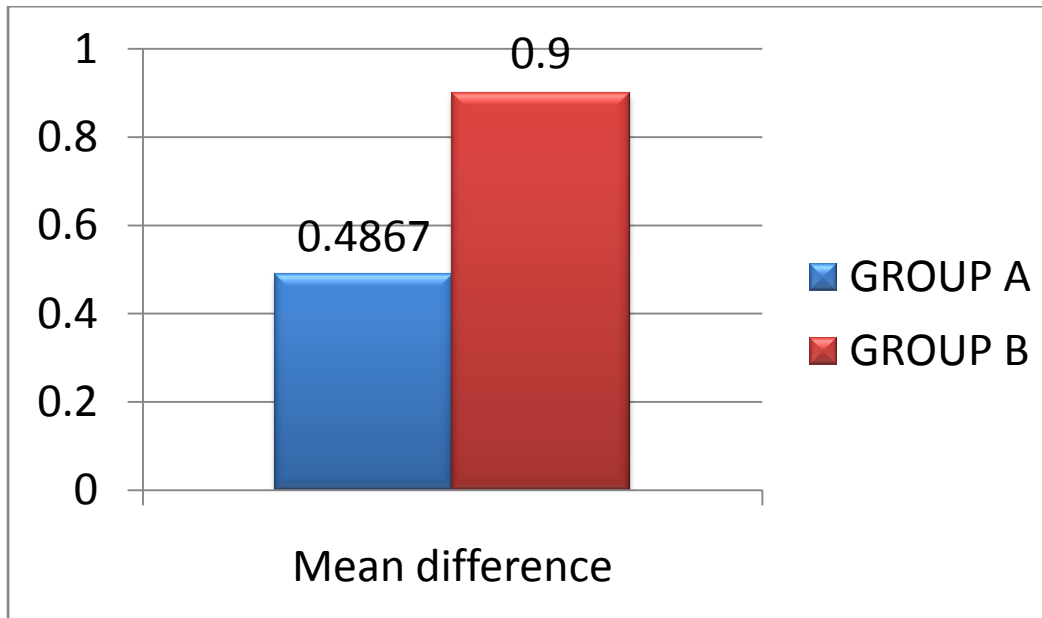
- According to table 1, for the group A (conventional group) subjects treated with strengthening exercises, the pre test mean navicular drop value is 2.907 and post test mean navicular drop value is 3.393
- The comparison of pre and post test values of navicular drop by paired t test showed that there was a statistically significant difference with t value 19.031 at p value <0.0001
- For the group B (Experimental group) subjects treated with strengthening exercises and kinesio taping, the pre test mean navicular drop value is 3.013 and post test mean navicular drop value is 3.913





- The comparison of pre and post test values of navicular drop in experimental group is done by paired t test showed that there was a statistically significant difference with t value 32.606 at p value <0.0001

**Table 2:**



- The table 2 shows the comparison of outcome values for navicular drop test between the groups and the mean result of group A is 0.4867 and mean result of group B is 0.900 when comparison was done by unpaired t test then it showed that there was a statistically significant difference with t value being 10.985 with p value observed to be <0.0001

#### **Discussion:**

- This study was done to compare the effect of strengthening exercises and kinesio taping in functional flat feet. The outcome measure used in this study was navicular drop test (ICC: 0.95) and result of this study showed that kinesio taping is more effective statistically when compared to group A
- Generalised foot fatigue in flat feet can be caused by overuse of intrinsic musculature
- In this study individuals were selected in age group of 18-30 years with an aim to provide them the best possible treatment to avoid further complications like plantar fasciitis, metatarsalgia, hallux valgus, achilles tendinopathy, balance impairment
- GROUP A that is control group subjects were treated with intrinsic foot strengthening exercises were comfortable and had no difference or difficulties in their physical activities like running, jumping and walking, whereas few individuals had experienced slight pain and fatigue along the medial longitudinal arch, which subsided later on.
- Comparison of pre and post test values of navicular drop of group A subjects by paired t test showed that there was a significant difference with p value being <0.0001 & mean difference being 0.4867 and t value is 19.031



- The results are in line with the study done by Edward p.malligan in 2013.They concluded that a four week short foot exercise training program emphasizing the recruitment of plantar intrinsic foot muscle may have value in dynamically supporting the medial longitudinal arch of foot
- Also strengthening protocol consists of tendoachilis stretches and heel raises; as due to biomechanical changes in flat feet, fibres of gastrocnemius is in mechanical disadvantage and cannot work efficiently, so exercises are aiming to normalise the length tension relationship and improve the efficiency of muscles
  
- GROUP B subjects were treated with kinesio taping and foot strengthening exercises. Comparison of pre and post test values of navicular drop was done with paired t test, which showed that there was a significant difference with p value being<0.0001 and mean difference being 0.900 with t value being 32.606
- Likewise, kenzo kase explained mechanism of effects of kinesio taping that it alters muscle function by acting on weakened muscles , decreased pain through neurological suppression, repositioning of subluxed joints
- Kinesio tape is designed to mimic the qualities of human skin. Kinesio tape has comfortable thickness to skin epidermis and can be stretched from its resting length
- Evidences suggested that taping reduces pronation, as indicated by shifts in midfoot pressure from medial to lateral as well as changes in forefoot and hindfoot forces due to biomechanical changes like eversion of calcaneus in relation to talus & medial rotation of navicular occurs in flat feet
- Also kinesio taping stiffens the ankle joint and limits the hypermobility
- During the study, we encountered some difficulties like kinesio tape which was supposed to stay on the foot for 5 days , came off within 3-4 days due to sweating and it was difficult to make the tape stay as the edges came off due to repeated wearing and removing of socks; so reinforcement was needed for few subjects
- Both the groups showed improvement in navicular drop; but Group B subjects treated with kinesio taping along with strengthening exercises showed greater improvement and the difference is also statistically significant
- The results are supported by previous studie that explained the effect of strengthening and effect of kinesio taping by kenzo kase
- The results of this study showed the comparison between strengthening exercises and kinesio taping on navicular height in functional flat feet
- The effect of both the interventions were significantly different from each other
- The basic mechanism of both the interventions is to support foot arches and reduces foot pronation and prevent further complications
- There was no previous direct comparison between these interventions in adults with functional flat feet aged 18-30 years.



**Conclusion:**

- The study was done to compare the effect of strengthening exercises and kinesio taping on functional flat feet aged 18-30 years
- There was a statistically significant increase in navicular height in both the groups; but greater significant difference was seen in group B subjects treated with kinesio taping along with strengthening exercises
- Thus, the results of this study concluded that kinesio taping was found to be more effective on functional flat feet aged 18-30 years.

**References:**

1. Donella L.Headlee<sup>a</sup>Jamie L.Leonard<sup>b</sup>Joseph M.Hart<sup>a</sup>Christopher D.Ingersoll<sup>a</sup> JayHertel<sup>a</sup> Fatigue of the plantar intrinsic foot muscles increases navicular drop Journal of electromyography& kinesiology (2008)
2. Flat foot:foot and ankle clinic Richie DH Jr; Biomechanics and clinical analysis of the adult acquired flatfoot. Clin Podiatr Med Surg. 2007
3. Article journal of student physical therapy research | 2010volume 2, number 3 Reliability & validity of navicular drop test
4. Manual Therapy Volume 18, Issue 5, October 2013, Pages 425-43 Effect of plantar intrinsic muscle training on medial longitudinal arch morphology and dynamic function Author links open overlay panelEdward P.MulliganPatrick G.Cook
5. J Phys Ther Sci. 2014 Mar;. Published online 2014 Mar 25. Strength Training for the Intrinsic Flexor Muscles of the Foot: Effects on Muscle Strength, the Foot Arch, and Dynamic Parameters Before and After the Training Takayuki Hashimoto, PT, MS<sup>1,2,\*</sup> and Keishoku Sakuraa, MD, PhD<sup>1</sup> Volume 22, Issue 4, December 2012, Pages 283-286
6. Int J Physiother. Vol 2(3), 491-501, June (2015) comparison of foot taping versus custom made medial arch support on pronated flat foot in school going children by K.Vadivelan and Ms. Gowthami kiyanduru
7. ZShiroshita T, Fukubayashi T. Effect of the Toe Exercises on the Medial Longitudinal Arch of the Foot. Rigakuryoho Kagaku. 2012 Aug 1;27
8. Kelly LA, Cresswell AG, Racinais S, Whiteley R, Lichtwark G. Intrinsic foot muscles have the capacity to control deformation of the longitudinal arch. Journal of The Royal Society Interface. 2014 Apr 6;11(93):20131188.
9. Exercises To Strengthen Toes That Every Runner Should Do By Victoria Davis published OCT. 13, 2016 womensrunning.competitor.com
10. Journal of physical therapy sciences(IN 2016) Joong-San Wang,<sup>1</sup> Gi-Mai Um,<sup>2,\*</sup> and Jung-Hyun Choi Immediate effects of kinematic taping on lower extremity muscle tone and stiffness in flexible flat feet
11. Whitaker , J.M., K. Augustus and S. Ishii. Effect of the low-Dye strap on pronation-sensitive mechanical attributes of the foot. Am. Podiatric Med. Associ. 2003;93(2):118-23
12. Gonzalez-Iglesias J, Fernandez-de-las-penas C, M. Short term effect of cervical kinesiotaping on pain and cervical range of motion in patients with acute whiplash injury:RCT. J orthop sports phys ther 2009;39:515-21