Category of Article: Original Research Effect of Kinesiotaping Versus Short Foot Exercises in Children with Functional Flat Feet

Riddhi Jani¹, Dr Nupoor Kulkarni²

¹Dr APJ Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences, Loni BK India
²Associate Professor dept of community physiotherapy, - Dr APJ Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences, Loni BK India.

ABSTRACT
Title: To compare the effectiveness of Kinesio-taping versus Short Foot Exercises in children with functional flat feet.
Background: Flat Foot also known as pes planus is the condition wherein the curvature of the medial longitudinal arch is flatter than the normal with entire sole of the foot comes in contact to the ground. These could be because of factors such as muscle weakness, ligament laxity, failure in development of reflexes even after the child starts walking, if left untreated this may lead to complications including the foot pain, frequent falls, impaired gait and can affect the quality of life too.
Objective: The objective of the study was to compare the effects of Kinesiotaping and Short Foot Exercises on children with functional flat feet.
Method: 30 students were selected for the study according to the inclusion and exclusion criteria and were divided into Group A and Group B. The individuals in Group A received Kinesio-taping along with short foot exercises and the individuals in Group B received the short foot exercises.
Results: Both the groups showed improvement in navicular drop test and the foot posture index but individuals in group B treated with kinesio-taping and short foot exercises showed more statistical significance. Conclusion: The study concluded that kinesio-taping along with short foot exercises was found to be effective as a treatment plan for children with functional flat feet aged 6-12 years.
Keywords: Pes planus, Kinesio-tape, podiatric exercises

INTRODUCTION
Pea planus also called as the flat foot is the condition where in the curvature of the medial longitudinal arch is flatter than the normal, with the entire sole of the foot coming into complete or near-complete contact with the ground. Flat foot can be classified into 2 main types: flexible flat foot and rigid flat foot. (5). Flexible flat foot: the longitudinal arches are present on heel elevation i.e., tiptoe standing and during non-weight bearing but will disappear when there is complete weight bearing on the foot. FF is also known as developmental FF commonly observed in infants and toddlers as a part of normal development. Rigid flat foot: the longitudinal arches of the foot are absent in during heel elevation i.e.
tiptoe standing as well as during weight bearing and is usually associated with underlying pathology. The feet appear to be flat in infants due to presence of fat and usually begins to resolve after 2 years of age. The arch of the foot starts developing when the child starts walking and the foot starts to bear the body weight. These arches rapidly develop between 2-6 years of age and mature around 12-13 years of age. Complications associated with flat foot include foot pain, hallux valgus, knee problems, impaired range of motion, loss of muscle strength leading to compensatory mechanism which may aggravate the dysfunction. Pain most commonly hampers the activities of daily living, gait, balance, quality of life and increases the risk of fall. (6) The deformity must be managed properly as it may lead to fatigue and cramping in the lower limbs and legs. (6). There are different conservative and surgical interventions for management of flat feet. Conservative methods include exercises, arch supports, orthopedic shoes, braces whereas the surgical interventions include soft tissue surgeries, bone surgeries (6) Kinesio Taping (KT) is a technique that helps relieve pain, relaxes the muscle, and increases the proprioception. KT is a natural, inexpensive treatment which facilitates the body’s natural healing process by providing support and stability to the muscles and the joints without restricting the range of normal. It provides sensory feedback. The method was introduced in Japan. (6)

AIMS To compare the effects of Kinesio-taping and Short Foot Exercises in children with Functional Flat Feet.

OBJECTIVES
1. To study the effect of kinesio-taping in children with functional flat feet.
2. To study the effect of short foot exercises in children with functional flat feet.
3. To compare the effect of kinesio-taping and short foot exercises in children with functional flat feet.

MATERIALS: Pen, Paper, Ruler, Kinesio tape, Scissor Materials, Informed consent

PROCEDURE
Study design prepared before beginning the study and the ethical approval was taken from the IEC at Dr. APJ. Abdul Kalam. College Of Physiotherapy and from the Principal of the LITTLE FLOWER SCHOOL, LONI. All the participants referred in LITTLE FLOWER SCHOOL, LONI were screened according to the inclusion criteria and exclusion criteria. Before the commencement of the study, informed consent was taken from the parents seeking permission for the children participation and informing about the procedure. Demographic Data was taken of the children consisting of the Name, Age, Gender, Weight and the Height. After taking the consent and the demographic data of all the participants, they were randomly allocated into Group A (n=15) and Group B (n=15). Group B individuals were made to perform Short Foot Exercises and Group A individuals received Kinesio taping along with the Short Foot Exercises. Pre-test was assessed which was determined through the Navicular Drop Test and the Foot Posture Index and the post-test was assessed in the same way after 4 weeks and the statistical analysis was done post-test.
EXERCISE DETAILS

Short foot exercises and Kinesio taping are used in Group A. Plantarflexion and dorsiflexion of the ankles were part of the five-minute warm-up. Short foot exercises that were identical to those provided in the usual group were performed after kinesio taping was placed. A. How to apply Kinesio taping procedure: One day before the tape was applied, the subjects’ skin was examined to see if they were sensitive to it. Only those who showed no signs of irritation were included in the follow-up investigation. For the sensitivity test, a portion of the tape was placed on the back of the lower thigh. The region was then examined for blisters, redness, or any inflammation. Individuals were forced to lie on their backs. The foot is positioned in neutral dorsiflexion, minimal inversion, and subtalar neutral posture. Four two-inch-wide "I" tapes were used for the prone taping procedure. the first piece of tape was placed to the plantar aspect, extending from the metatarsal head to the calcaneum. The second piece of tape was secured on the outside of the foot, wrapped medially around the back of the ankle, and then placed diagonally beneath the calcaneus. This piece of tape assisted in limiting the calcaneal eversion and keeping the calcaneus in a more neutral position. The third piece of tape was placed on the medial midfoot, brought under the calcaneus diagonally, and wrapped laterally around the posterior ankle to help "lock" the calcaneus in place or facilitate sensory input. Starting from the lateral midfoot, the fourth piece of tape would cross the navicular and reach the medial distal third of the lower leg, directly above the malleolus that supports the midfoot (5). For four weeks, the participant will be required to complete foot strengthening activities in addition to receiving Kinesio taping. The exercises for strengthening would be the same as those offered to the traditional group. Every five days, the tape would be swapped out. Group B: Short Foot Exercises. A warmup session of 5 minutes was given prior to the exercises which included ankle dorsiflexion and plantarflexion. The Short Foot exercises was then given to the patients which included:

<table>
<thead>
<tr>
<th>EXERCISES</th>
<th>POSITION</th>
<th>REPETITIONS</th>
<th>SETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARM UP</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Ankle dorsiflexion and plantarflexion</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Towel crawls</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Picking up small objects</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Extension of great toe</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Toe spreads</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>Ball rolling</td>
<td>High sitting</td>
<td>5 reps for 1-2 mins</td>
<td>2 sets</td>
</tr>
<tr>
<td>COOL DOWN</td>
<td>Standing</td>
<td>10 reps with 10 sec hold</td>
<td>2 sets</td>
</tr>
<tr>
<td>Heel raises</td>
<td>Standing</td>
<td>10 reps with 10 sec hold</td>
<td>2 sets</td>
</tr>
<tr>
<td>Calf stretches</td>
<td>Standing</td>
<td>10 reps with 10 sec hold</td>
<td>2 sets</td>
</tr>
</tbody>
</table>

Table-4.1: Distribution of children with functional flat feet according to gender in both groups.
<table>
<thead>
<tr>
<th>Sno</th>
<th>Gender</th>
<th>Group-A Experimental</th>
<th>Group-B Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>10(66.7%)</td>
<td>6(40.0%)</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>5(33.3%)</td>
<td>9(60.0%)</td>
</tr>
</tbody>
</table>

Chi-Square value=2.141
df=1, p=0.143, NS

NS-Not significant. i.e., p>0.05.

**Graph-4.1a)** Gender proportion of children in group-A.

**Graph-1b)** Gender proportion of children in group-B.

---

**Table-4.2:** Range, mean and SD of age of the children with functional flat feet in both the groups.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variable</th>
<th>Group-A: Experimental</th>
<th>Group-B: Control</th>
<th>Unpaired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>Mean ± SD</td>
<td>Range</td>
</tr>
<tr>
<td>1</td>
<td>Age in years</td>
<td>6-12</td>
<td>9.33±1.87</td>
<td>7-10</td>
</tr>
<tr>
<td>2</td>
<td>Height (cm)</td>
<td>112-132</td>
<td>126.47±4.53</td>
<td>114-136</td>
</tr>
<tr>
<td>3</td>
<td>Weight (kg)</td>
<td>21-29</td>
<td>24.33±2.46</td>
<td>20-26</td>
</tr>
<tr>
<td>4</td>
<td>BMI</td>
<td>12.62-17.54</td>
<td>15.22±1.45</td>
<td>12.62</td>
</tr>
</tbody>
</table>

NS-Not significant. i.e., p>0.05.
Graph-4: Mean and SD of weight (kg) of children with functional flat feet in both groups

Graph-5: Mean and SD of BMI of children with functional flat feet in both groups
Graph-6: Pre and post test navicular drop (cm) of children with functional flat feet in group-A

- Mean ± SD

Graph-7: Pre and post test Foot posture index of children with functional flat feet in group-A

- Pre test
- Post test
### Table 4.3: Range, mean and SD of outcome measures of children with functional flat feet in group-A

<table>
<thead>
<tr>
<th>Sno</th>
<th>Outcome measures</th>
<th>Group-A: Experimental</th>
<th>Paired t-test/ Wilcoxon test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
<td>Post test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>Mean ±SD</td>
<td>Range</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>1</td>
<td>Navicular drop test (cm)</td>
<td>1.00-1.90</td>
<td>1.37±0.21</td>
<td>0.40-1.60</td>
</tr>
<tr>
<td>2</td>
<td>Foot function index</td>
<td>6-12</td>
<td>9.33±1.76</td>
<td>6-10</td>
</tr>
</tbody>
</table>

Note: * denotes –Significant (p<0.05), t- paired t-test, z- Wilcoxon test,

### Table 4.4: Range, mean and SD of outcome measures of children with functional flat feet in group-B

<table>
<thead>
<tr>
<th>S no</th>
<th>Outcome measures</th>
<th>Group-B: Control</th>
<th>Paired t-test/ Wilcoxon test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>Mean ±SD</td>
<td>Range</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>1</td>
<td>Navicular drop test (cm)</td>
<td>1.00-1.40</td>
<td>1.21±0.13</td>
<td>0.40-1.30</td>
</tr>
<tr>
<td>2</td>
<td>Foot function index</td>
<td>6-9</td>
<td>8.47±1.18</td>
<td>6-8</td>
</tr>
</tbody>
</table>

Note: * denotes –Significant (p<0.05), t- paired t-test, z- Wilcoxon test,
Table 4.5: Comparison of pre and post-test outcome measures of children with functional flat feet in between the groups.

<table>
<thead>
<tr>
<th>Sno</th>
<th>Outcome measures</th>
<th>Pre test</th>
<th>Post test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>1</td>
<td>Navicular drop test (cm)</td>
<td>1.37±0.21</td>
<td>1.21±0.13</td>
</tr>
<tr>
<td>2</td>
<td>Foot function index</td>
<td>9.33±1.76</td>
<td>8.47±1.18</td>
</tr>
</tbody>
</table>

Between group comparisons: Mann-Whitney U test
- Navicular drop: t=1.462, p=0.273, NS
- Foot posture: z=1.670, p=0.086, NS
- Navicular drop: t=1.159, p=0.256, NS
- Foot posture: z=2.006, p=0.045, S

S - denotes significant (p<0.05); NS - not significant (p>0.05).

Graph 10: Pre and post test navicular drop (cm) of children with functional flat feet in between the groups.
DISCUSSION
Experimental group participants were treated with kinesio-taping along with short foot exercises targeting the strengthening of the intrinsic muscles of the foot. Comparison of pre and post-test values of navicular drop, and foot posture index was done which showed that, there was significant difference in the Foot posture index with p value being <0.05 and mean difference being highly significant. This effect of Kinesio-taping is based on the mechanism explained by, Kenzo Kase that kinesio - Kinesio- tape is designed to mimic the qualities of human skin. The tape has comfortable thickness to skin epidermis and can be stretched from its resting length studies suggested that taping reduces pronation, as indicated by shifts in midfoot pressure from medial to lateral along with the changes in forefoot and hindfoot forces due to biomechanical changes like eversion of calcaneus in relation to talus & medial rotation of navicular commonly seen in flat feet. (5)
Conventional group participants were treated with short foot exercises. Comparison of pre and post-test values of the navicular drop test and the foot posture index was done which showed that there was significant difference seen with p value being <0.05
Short foot exercises help in strengthening of the intrinsic muscles of the foot namely the abductor hallucis, flexor digitorum brevis and the quadratus plantar. They serve as an important role in stabilising
the medial longitudinal arch. Intrinsic foot muscles also play an important role in static balance, such as
standing on one leg, and in adjusting posture.
The result from the statistical analysis of the study supported the alternative hypothesis which stated that
there is a beneficial effect seen on the subjects with both short foot exercises along with kinesio-taping
and the short foot exercises.

CONCLUSION
The result of the study shows that:
● Both the interventions in experimental and control group were found to be individually effective in
treating children with functional flat feet
● But, while compared the post-test outcomes in between the groups, the experimental group was
significantly better than control group of children with functional flat feet.

REFERENCES
1. Chen KC, Chen YC, Yeh CJ, Hsieh CL, Wang CH. The effect of insoles on symptomatic flatfoot in
Sep;98(36):e17074. doi: 10.1097/MD.00000000000017074. PMID: 31490409; PMCID: PMC6738981.
2. Huang C, Chen LY, Liao YH, Masodsai K, Lin YY. Effects of the Short-Foot Exercise on Foot
PMCID: PMC9564534.
Flat Foot: A Pre-Post Experimental Study.
4. Weber-Rajek M, Lulińska-Kuklik E, Goch A. The positive role of kinesio taping in adjunctive
therapy of static planovalgus feet in children between the ages of 5 and 7. Baltic Journal of Health
5. Patil P. Effect of Kinesio taping as an adjunct to strengthening exercises in functional flat feet.
Arch Support Combined with Exercises in Adult Flatfoot--An Experimental Study. INDIAN J
PHYSIOTHER ORezaei A, Hosseini SS, Khosravi S, Kosarimoghadam M, Amirpour Najafabadi B,
Golnari MK. Evaluation of the Effect of Kinesio Taping on the Plantar Arch Index of Children with
Spastic Diplegic Cerebral Palsy. Journal of Advances in Medical and Biomedical Research. 2023 Jan
with Flat Foot Disorder. KnE Medicine. 2023 Mar 8:231-42.
8. de Baptista CR, Vicente AM, Souza MA, Cardoso J, Ramalho VM, MattielloSverzut AC. Methods
of 10-meter walk test and repercussions for reliability obtained in typically developing children.


