

## Original Article

# EFFECTIVENESS OF FOOT ORTHOSIS IN FLAT FEET CHILDREN OF AGE 6-15 YEARS; A QUASI-EXPERIMENTAL STUDY

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### **ABSTRACT**

Flat foot (also called pes planus or fallen arches) is a postural deformity but a relatively common and usually painless condition. This is categorized as a childhood developmental issue when arches fail to develop owing to multiple reasons resulting in the problem in both ankle and legs. The study aimed to Determine the effectiveness of Foot orthosis in relation to foot flat. And to study the time duration for the correctness of flat foot through soft foot orthosis in children.

**Material and Methods:** This Quasi-experimental study was conducted at the Pakistan Institute of Prosthetic and Orthotic Sciences (PIPOS) rehabilitation program, Peshawar, Pakistan. The study was conducted over a period of 6 months (July 2018 - December 2018). A stratified random sampling technique was adopted for the study and 10 flat feet patients aged 6-15 years were inducted. Data were collected in two steps i.e. (Pretest and post-test data). Data was analyzed using SPSS Version-22.

**Results:** The mean age of study participants was 10.5± 2.8 years. Post-test measurement for 3 (30%) patients was less than 1cm, while that of 7 (70%) patients scored 1cm or above. Participants (40%) with pretest measurements more than 5mm have shown significant improvement in achieving the target value except one, while correction of flat feet was slow in participants with measurements less than 5mm.

**Conclusion:** The study suggests that soft foot orthosis has a good effect on children with flat feet. Early treatment for children with flat feet is too much necessary.

**Key Word:** Flat Foot, Foot Orthosis, Ankle

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## **INTRODUCTION**

The foot is a complex structure comprised of 28 different bones including sesamoids, which combine forming different joints that adapt towards the level of walking, jumping, walking up or down the hill, or even towards uneven surfaces. Dysfunction of the foot can often arise by losing its normal structural support, thus altering its shape. Prolong abnormal forces on the foot tends to disturb the normal arch of the foot which results in loss of the medial longitudinal arch support.<sup>1</sup> Children with flat feet also known as pes planus, do not have a normal medial arch. It means that when the child is standing, the plantar surface of the foot contact with the ground.<sup>2</sup> The foot has three arch support; medial longitudinal arch, lateral longitudinal arch, and transverse arch.

Foot orthosis is commonly recommended for the treatment of the flat foot.<sup>3</sup> The biomechanical effects of such orthoses are not yet fully clear and the time duration of correctness for the follow-up is not clear.<sup>4</sup> Foot orthoses are specially designed shoe inserts that help to support the feet and correct foot imbalances. Some of the foot and lower limb problems that can be successfully treated in the long term with orthoses include Flat feet, corns and calluses, foot ulceration, recurrent ankle sprain, plantar fasciitis, or heel spur syndrome.<sup>5</sup> Feet provide the base of support and flat foot is common in children if not treated well in time can lead to pain in the foot and various knee problems including hallux valgus. It needs proper treatment which is necessary for children, but currently, the time duration for the correctness of flat feet in children with soft foot orthosis is unknown which is very necessary for a proper treatment protocol, so that the children

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can follow that time duration for using soft of foot orthosis made from EVA. Foot orthosis prescription had always been beneficial for the patients as its customized and as per the measurements of the patient's sizes causing less discomfort and more durable.<sup>6</sup>

This particular experimental research was conducted to check the effectiveness and time duration of the correctness of flat feet with soft foot orthosis i.e. made from EVA so that we can check the effectiveness of soft foot orthosis.

## MATERIAL AND METHODS

A Quasi-experimental study was carried out to determine the effectiveness of Foot orthosis in relation to foot flat and to know about the time duration for the correctness of flat foot through soft foot orthosis in children at PIPOS rehabilitation program Peshawar, Pakistan. The duration of the research study was six months (from July 2018 to December 2018). Every part of the ethical issues associated with the research study was comprehensively reviewed with the responsible representative of the PIPOS rehabilitation program Peshawar. A stratified random sampling technique was adopted. The sample size for the research study was 10 and children with the flat foot were inducted into the study. The intervention was given by making soft foot orthosis made from EVA foam. Data were collected in two steps i.e. (Pretest and post-test data). Pre-measurements were taken at the start of the study and post measurements were recorded after 3.5 months. Data were analyzed by using SPSS- Version 22 mean  $\pm$  SD of parameters were determined post-test achievements are given as a percentage.

## RESULTS

The mean age of study participants was 10.5 $\pm$  2.8 years. Post-test measurement for 3 (30%) patients was less than 1cm, while that of 7 (70%) patients scored 1cm or above. Participants (40%) with pretest measurements more than 5mm have shown significant improvement in achieving the

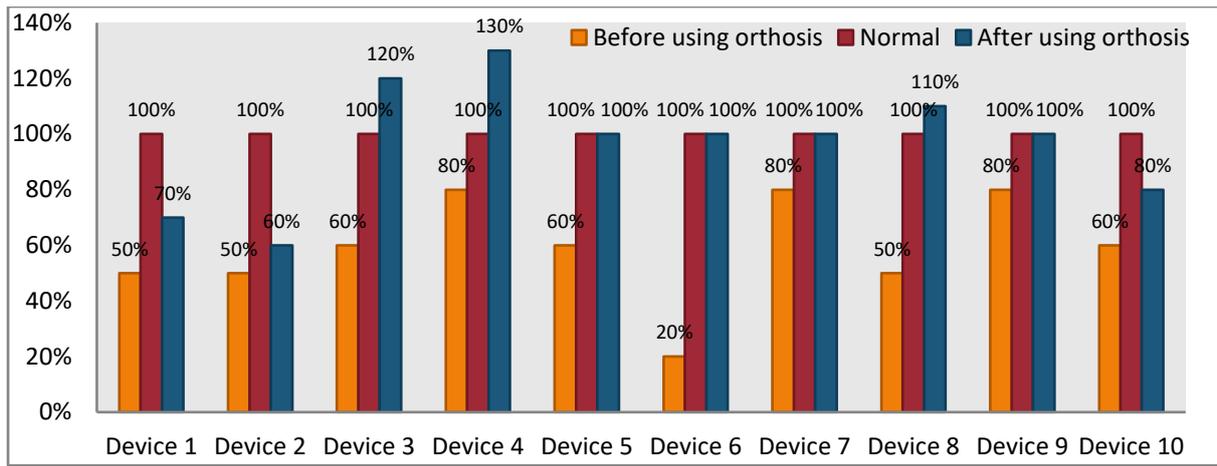
target value except one, while correction of flat feet was slow in participants with measurements less than 5mm.

On average, soft foot orthoses remain effective in achieving a 3.8mm increase in measurements for flat feet children during three and half month (3½) period. Surprisingly, 50% of participants with flat feet showed effectiveness only between 1-2 mm. However, only one patient achieved the target value (1cm) while its pretest data was 2mm which shows more improvement than others.

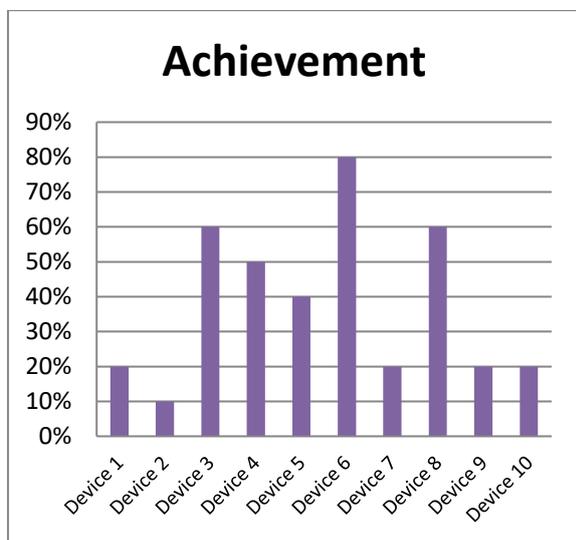
Overall, it is concluded that soft foot orthosis has a good effect in treating children with pes planus.

**Table-1:** Pre-& Post Measurements for Foot Orthosis and achievement after intervention

Sr. NO.	Devices	Pre-intervention measurements	Post-intervention measurements	Achievement
1	Device 1	5mm (Rt)	7mm (Rt)	2 mm
2	Device 2	5mm (Lt)	6mm (Lt)	1 mm
3	Device 3	6mm (Rt)	12mm (Rt)	6 mm
4	Device 4	8mm (Lt)	13mm (Lt)	5 mm
5	Device 5	6mm (Rt)	10mm (Rt)	4 mm
6	Device 6	2mm (Rt)	10mm (Rt)	8 mm
7	Device 7	8mm (Lt)	10mm (Lt)	2 mm
8	Device 8	5mm (Rt)	11mm (Rt)	6 mm
9	Device 9	8mm (Lt)	10mm (Lt)	2 mm
10	Device 10	6mm (Rt)	8mm (Rt)	2 mm



**Figure 1:** Graph showing normal medial arch, flat and achieved medial arch results



**Figure-2:** Achievement with Foot Orthosis

**DISCUSSION**

The objective of the study was to know the effectiveness of soft foot orthosis for children having flat feet. From the results, it’s clear that soft foot orthosis had positive results on treating flat feet and it increases the height of the medial arch if used properly. Secondly, the results from the other literature say that the time that should be given for the use of foot orthosis should have 4 ½ months, and studies have reported results in 4 months<sup>7</sup> but this research study concluded that within 3 ½ months the medial arch starts going to elevate through soft foot orthosis in flat feet children. In the current study, some of the participants scored very low readings and are far from the target value, which can be due to the reason that the participants didn’t follow the proper

time duration to use the orthosis as it was advised to them. Another reason can be the vigorous use of orthosis. Secondly, maybe the patient feels uncomfortable while walking with insoles as it was a new modification to their feet so they quite it most frequently.

Arch development occurs during the first 10 years of life. A foot orthosis is an effective approach towards the pronated feet. Some studies found an immediate effect of foot orthosis on foot structure, which goes in a similar direction as found in our study.<sup>8,9</sup>

The results of several studies indicated that foot orthoses are very useful in treating flat feet.<sup>10-13</sup> The age limit is very necessary for using soft foot orthosis. i.e., the soft foot orthosis is beneficial for children age 6 to 15 years. But the researchers conduct the study on large scale and more time duration was given for the follow-up and thus achieved excellent results as compared to this study, had given 3 ½ months for follow up duration that’s why it scored comparatively less while the same age patients are included in this research study that shows the good effect on medial arch.<sup>14,15</sup>

One of the studies concluded that soft foot orthosis when combined with foot exercises and activity modification, it plays an important role in maintaining medial arch, the study achieved good results as compared to this study due to the inclusion of regular foot exercises which enhance the function of muscles and more prone to achieve effective

results, but this research study had achieved the same results only by using soft foot orthosis for flat feet children due to which the study has shown more effectiveness than this study.<sup>16</sup>

Another study summarized the use of soft Fo's, prefabricated and therapeutic insoles for the treatment of medial arch and concluded that it creates a notable difference in the medial arch of flat feet children's which is similar to the result of this study only by using soft Fo's made from EVA. The prefabricated insoles have a good biomechanical effect but are more expensive while the custom-made foot orthosis is not costly and thus produces the same effect on flat feet.<sup>17,18</sup>

Martin Pfeiffer summarized that boys had a significantly greater tendency to maintain medial arch through the use of soft Fo's as compared to girls which are similar to the results of this study when the comparison between the results of boys and girls takes place and support the results of this study as boys use to walk and run more as compared to girls so by that reason boys are more prone to achieve the best results due to regular use of foot orthosis in proper shoes. In the case of girls, they have a large amount and different designs of sandals in which the insoles cannot be used and thus needs more time for the treatment of flat feet.<sup>19</sup>

## CONCLUSION

The study suggests that soft foot orthosis has a good effect on children with flat feet. The foot orthosis reduces the pressure on the medial side of the foot and tends to stabilize the foot and most importantly the structure of the foot is reinstated as the normal foot. Early treatment for children with flat feet is inevitable, but the medial arch starts going to its normal position within the first 3 months of using soft foot orthosis. So proper time duration must also be followed to achieve the best results. Proper donning of foot orthosis is important and the parents need to be educated for proper hygiene in order to sustain its form.

## RECOMMENDATIONS

The study population should be increased for future researches. Comparison between a normal child and flat feet should be done to check the activities of daily life bases. More time duration should be given for the use of orthosis to get the best results and get the proper medial arch. The effect of soft foot orthosis on gait kinetics should be studied in the future for detailed study.

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**Conflict of Interest:** None

## AUTHOR'S CONTRIBUTION

AH: Design and study conception, data collection, and data analysis

SA: Drafting the article, literature review, and approval of the final draft

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