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Effect of corrective exercises programme among athletes with flat feet on foot alignment factors

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Abstract

Foot posture, like most human anthropometric characteristics, varies considerably among children, adults and the older population. Therefore, there is a need for strategies to accurately classify foot posture and define normal and potentially 'abnormal' foot types. The main objective of this study is to find out the effectiveness of corrective exercises programme influence to change the flat feet alignment factors after 12 weeks of training. To achieve this purpose 550 athletes tested by foot morphology such as angle of arch foot, medial longitudinal arch, navicular height by using pedograph method. From the total population 78 athletes had flat feet out of which forty voluntary participations were selected for this study. The selected subjects divided into two groups, such as experimental group (EG) (n=20) and control group (CG) (n=20). Experimental group were undergone training of corrective exercise programme for five days in a week for total twelve weeks. The control group did not participate any specific corrective exercise training to improve foot morphology. Both the group athletes were tested prior (pretest) to training and after the treatment period (posttest) on foot alignment factors and the data were analyzed and interpreted with ANCOVA and paired sample 't' test, the level of significance is at 0.05 level. The result was concluded that, 12 weeks of corrective physical exercises programme for experimental group (EG) significantly improved in angle of arch foot (AAF), navicular height (NAH) and medial longitudinal arch (MLA). The experimental group (EG) compare with control group (CG) better significant improvement on angle of arch foot (AAF) and Navicular height (NAH) of the flat feet players when compare to control group (CG).

Keywords: Corrective exercises, angle of arch foot, medial longitudinal arch, navicular height

Introduction

Flat feet also called pes planus or fallen arches is a postural deformity in which the arches of the foot collapse, with the entire sole of the foot coming into complete or near-complete contact with the ground. Some individuals (an estimated 20–30% of the general population) have an arch that simply never develops in one foot (unilaterally) or both feet (bilaterally). There is a functional relationship between the structure of the arch of the foot and the biomechanics of the lower leg. The arch provides an elastic, springy connection between the forefoot and the hind foot. This association safeguards that a majority of the forces incurred during weight bearing of the foot can be dissipated before the force reaches the long bones of the leg and thigh. In pes planus, the head of the talus bone is displaced medially and distal from the navicular. As a result, the spring ligament and the tendon of the tibialis posterior muscle are stretched, so much so that the individual with pes planus loses the function of the medial longitudinal arch (MLA). If the MLA is absent or nonfunctional in both the seated and standing positions, the individual has "rigid" flatfoot. Flatfoot is often a complex disorder, with diverse symptoms and varying degrees of deformity and disability. There are several types of flatfoot, all of which have one characteristic in common: partial or total collapse (loss) of the arch. A common and usually painless condition, flatfoot can occur when the arches don't develop during childhood. Some children have flexible flatfoot, in which the arch is visible when the child is sitting or standing on tiptoes, but disappears when the child stands. Most children outgrow flexible flatfoot without problems. Arches can also fall over time. Years of wear and tear can weaken the tendon that runs along the inside of your ankle and helps support your arch. This flat foot mostly affects the sports performance.

Statement of the Problem

The present study is designed to examine effect of corrective exercise programme among athletes with flatfeet on foot alignment factors. There is no sufficient remedies and solution for to correct the flat foot for athletes this study was a good attempt to get the solution for this problem.

Methodology

Selection of the Subjects

To achieve this purpose 550 athletes were tested by foot morphology such as angle of arch foot, medial longitudinal arch, navicular height. The sample was selected from the regional athletes of Puducherry, India. Forty voluntary participations were agreed and selected for this second part of the research. The selected subjects were divided into two groups experimental group (n=20) and control group (n=20). Experimental group were undergone training of corrective

exercise for five days in a week for total twelve weeks. The control group did not participate any specific training to improve foot morphology.

Selection of Variables

The independent variable as corrective physical exercise and dependent variables are foot alignment factors.

Foot Alignment Factors

- Angle of Arch foot
- Medial Longitudinal arch
- Navicular height

12 Weeks Training Programme For Counteractive (Corrective) Exercises

Week	Days	Exercise	Volume	Duration
Week 1	Monday to Friday	Calf rises, Step stretch, Towel curls, Doming, Toe spread & squeeze	10 sets of 10 reps 30 seconds rest interval between exercise	Total 1 hour in a session of a day including 10minutes warming up 40 minutes exercise and 10 minutes are stretching exercise.
Week 2	Monday to Friday	Tennis ball exercise, tippy toe walk, side walk, walk in sand, towel stretch	2 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes are stretching exercise.
Week 3	Monday to Friday	Tip-toe coin push	10 sets of 10 reps	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
		Roll of the feet with golf ball	2 minutes in 3 sets	
		Downward facing dog	2 minutes in 3 sets	
		Frozen can roll	10 sets of 10 reps	
		Theraband pull-single leg	10 sets of 10 reps	
Week 4	Monday to Friday	Toe walk, toe jaggig, step walk, single leg hops, double leg hops	2 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 5	Monday to Friday	Foam roller	10 sets of 10 reps rest interval between exercises	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
		Single leg directional hops		
		Three points lunges		
		Squad jacks		
		Single leg mountain climbers		
Week 6	Monday to Friday	Single leg balance – squat, standing jump, lateral jump, single leg balance on forefoot, eccentric heel drop	2 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 7	Monday to Friday	Board, band, balance training, on the spot jump, duck walk	2 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 8	Monday to Friday	Calf rises, Doming, Step stretch,	10 sets of 20 reps 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 9	Monday to Friday	Tennis ball exercise, tippy toe walk, side walk, calf rises	5 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 10	Monday to Friday	Toe walk, toe jaggig, step walk, single leg hops, double leg hops	5 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 11	Monday to Friday	Board, band, balance training, on the spot jump, duck walk	5 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.
Week 12	Monday to Friday	Single leg balance – squat, standing jump, lateral jump, single leg balance on forefoot, eccentric heel drop	5 minutes for 3 sets 30 seconds rest interval between exercise	Total 1 hour in a session of the day including 10 minutes warming up 40 minutes exercise and 10 minutes stretching exercise.

Test Administration

Sl. No	Variables	Test	Unit
1	Angle of Arch foot	Padagraph foot print test	Centimeters
2	Medial Longitudinal arch	Padagraph foot print test	Centimeters
3	Navicular height	Navicular drop test	Centimeters

Results

To find out the pre and posttest intervention difference in experimental group due to application of corrective physical exercise programme for 12 weeks, paired sample t-ratio was applied.

The Summary of Pretest, Posttest Means and Dependent ‘T’ Test on Angle of Arch Foot, Navicular Height, Medial Longitudinal Arch on Experimental and Control Group

Group	Foot Alignment Factors	Pre-test (Mean ±SD)	Post-test (Mean ±SD)	MD	Df	T- ratio
Experimental Group (EG)	Angle of Arch Foot (AAF) (Centimeters)	15.00 ±10.336	22.85 ± 6.301	7.850	19	5.204*
	Navicular Height (NAH) (Centimeters)	2.91 ± 0.576	3.46 ± 0.634	0.545	19	9.909*
	Medial Longitudinal Arch (MLA) (Centimeters)	1.25 ± 0.379	1.98 ± 0.351	0.730	19	7.738*
Control Group (CG)	Angle of Arch Foot (AAF) (Centimeters)	26.25 ± 4.399	26.30 ± 4.414	0.050	19	0.438
	Navicular Height (NAH) (Centimeters)	3.68 ± 0.473	3.67 ± 0.494	0.005	19	0.370
	Medial Longitudinal Arch (MLA) (Centimeters)	2.11 ± 0.227	2.11 ± 0.220	0.000	19	0.000

*Significance at 0.05 level with df 19 is 2.086.

The above table shows the results of the angle of arch foot for experimental group, the attained t-ratio value was 5.204, found to be significant at the table value 2.086, it was understood that experimental group had significantly improved angle of arch foot due to the corrective exercise programme for 12 weeks. The above table shows the results of the angle of arch foot for experimental group, the attained t-ratio value was 9.909, found to be significant at the table value 2.086, it means that experimental group had insignificantly improved navicular height. The above table shows the results of the angle of arch foot for experimental group, the attained t-ratio value was 7.738, found

to be significant at the table value 2.086, the experimental group had insignificantly improved medial longitudinal arch. The above table shows that, the result for control group, the attained t-ratio value for AAF was 0.438, NAH was 0.370 and MLA was 0.000 found to be less than the table value 2.086, it was understood that control group had no significant result in all variables.

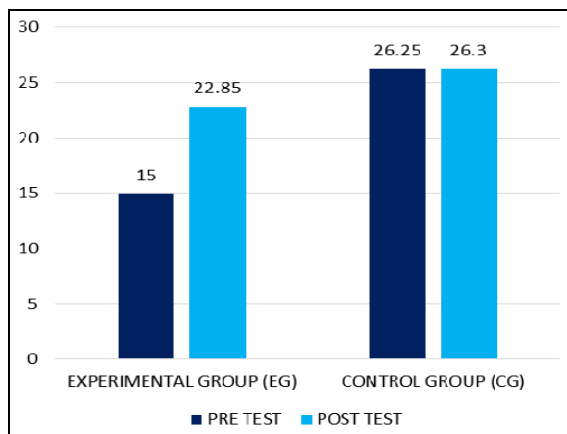
The Summary of Adjusted Post Means on Angle of Arch Foot, Navicular Height, Medial Longitudinal Arch On Experimental and Control Groups (in Centimeters)

Test	Experimental Group (EG)	Control Group (CG)	Df	Sum of Squares	Mean Square	F- ratio
Angle of Arches of Foot (AAF)	25.962	23.188	B 1 W 37	50.359 390.894	50.359 10.565	4.767*
Navicular Height (NAH)	3.852	3.283	B 1 W 37	2.074 1.213	2.079 0.033	63.419*
Medial Longitudinal Arch (MLA)	2.191	1.909	B 1 W 37	0.267 2.416	0.267 0.065	4.087

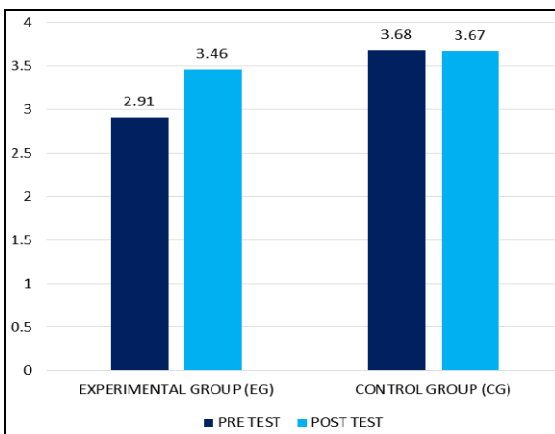
*significance at 0.05 level of confident with df 1, 37 for f table value is 4.10

It was evident that adjusted posttest of experimental group and control group on angle of arches of foot were the adjusted posttest means were 25.962 and 23.188 respectively. The obtained F-ratio value was 4.767, which is higher than the table value 4.10 with df 1 and 37 required for significance at 0.05 level. It shows that there used to be significant change among the adjusted post-test means of experimental group (EG) and the control groups (CG) on angle of arches of foot. The obtained F-ratio value on was 63.419, which is higher

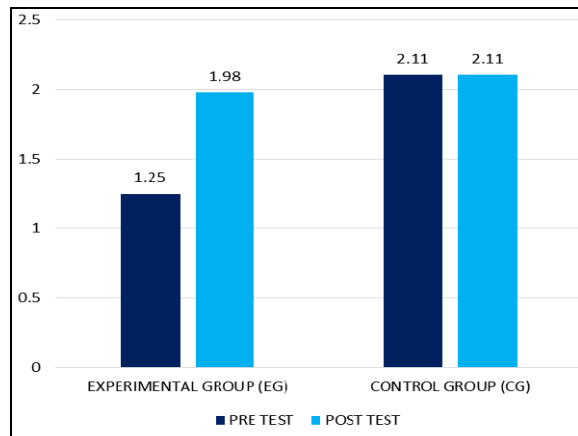
than the table value 4.10, it shows that significant improvement among the adjusted post-test means of experimental group (EG) and the control groups (CG) on navicular height. The obtained F-ratio value was 4.087, which is higher than the table value 4.10, it shows that there used to be insignificant change among the adjusted post-test means of experimental group (EG) and the control groups (CG) on medial longitudinal arch.



Angle of Arches of Foot (AAF) (Centimeters)

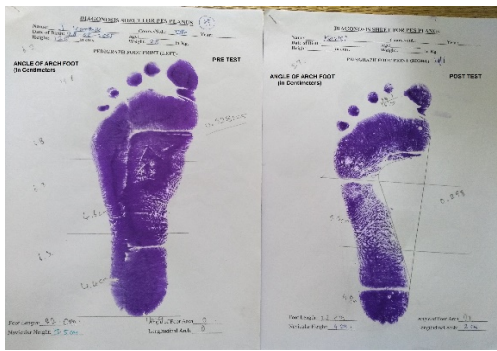


Navicular Height (NAH) (Centimeters)



Medial Longitudinal Arch (MLA) (Centimeters)

Figures of Pre and Post Test on Angle of Arch Foot (AAF), Navicular Height (NAH) and Medial Longitudinal Arch (MLA) Of Flat Feet Athletes



Conclusions

From the interpretation of the data the following conclusions were drawn

1. The 12 weeks of corrective physical exercise intervention for experimental group (EG) improves the Angle of Arch

- Foot (AAF), Navicular Height (NAH) and Medial Longitudinal Arch (MLA) from the Flat Feet (FF) players.
2. The control group (CG) was no significant change on the flat feet.
3. The experimental group (EG) compare with control group (CG) better significant improvement on angle of arch foot (AAF) and Navicular height (NAH) of the flat feet players.
4. The result showed that, there was no significant improvement on medial longitudinal arch (MLA) of the players when compared with control group.
5. Over all the result, it was concluded that the corrective physical exercise programme would help the flat feet players and recovered from the fall feet in to improved arches of foot.
6. The corrective physical exercises are the best method of training to improve foot alignment factors.

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