

# Study of Effect of Yoga Intervention Program on Foot Deformity and Associated Symptom Balance among School Students

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## ABSTRACT

*The purpose of the study was to test the effect of the yoga intervention in reversing foot deformity and associated symptom balance. Angular deviation of the ankle joint in school 80 students aged between 12-14 years were measured and also the same was assessed through footprint and angular measurement (flexion, extension, adduction, and abduction) done by the Goniometer. All the students were equally and randomly divided into two groups of 40 each. Group I was termed as an "experimental" group and a Group II was considered as "Control" group. The experimental group was progressively introduced to the selected Yogic practices. The practice session was conducted for 60 min. The yoga intervention given for 8 weeks except Sunday. The control group was not given any such training. Pre data (0 day) and Post angular measurement data (after 8 weeks) was taken for both groups to assess one's foot deflection using Goniometer. The score was expressed in degree and its associated symptom balance by employing Flamingo balance test. Yoga training is effective for reversing four types of foot defects that arises as a result four types walking action, such as on toes, on the heel, on Inward sole and on outward sole and also significantly improve balance.*

**Keywords :** *Foot deformity, associated symptom, Yoga module, school children, training*

## Introduction

The ancient Indian traditional knowledge of yoga enables the individual to attain and maintain a dynamic sense of physical, mental and spiritual well-being. The Bhagavad Gita defines Yoga as samatvam meaning thereby that Yoga is equanimity at all levels. (yogasthah kurukarmani sangam tyaktva dhananjaya siddiyasidhyoh samobutva

samatvam yoga uchyate (Bhagavad Gita II: 48). This may be also understood as a perfect state of health wherein physical homeostasis and mental equanimity occur in balanced and healthy harmony.

Good posture is the very sign of positive health (Thomas K. Cureton (2013)). The mechanism of locomotion is a complex task that involves the coordinated activation of many muscles. The existence of a law of kinetic co-variance that involves a tradeoff between the hip and knee torques, such that the variability of their sum is less than the variability of each joint (Winter, D. A., 1980). Due to wrong physical habits and lack of suitable exercises, postural defects may become a permanent feature (Y. Bade, I. Osman, I. Izzet & C. Mehmet (2018)), and the defects are of many kinds viz., Lordosis, Kyphosis, Knock-knee, Flat foot, Club foot, Talipes Equines, Talipes Calcaneus, Talipes Varus, Talipes Vaglus, etc., that may arise in childhood and or by birth (A. Anand & D. A. Sala, 2008) and above these based basic four types of foot deformities as observable from walking trends walk on toes (Talipes Equines), walk on heels (Talipes Calcaneus), inward sole (Talipes Varus) and outward sole (Talipes Vaglus) (A. Anand & D. A. Sala, 2008).

There are various research reports that defective footsteps lead to various psychological effects that remarkably consistently brood at a deep, unconscious feeling of insecurity. Distorted feet can have a negative impact on the body. (E. Wittkower, 2018). However, yogasanas are a unique physical posture and has a vital role in locomotor organs such leg and feet and it is being practiced bare footed, therefore its impact on foot anatomy is very significant. The practice of Yoga postures can transform our relationship with our feet. Practicing barefoot, we develop a greater feel for the ground below. As we become more intimate with our feet, they also become stronger and more mobile

However, there are no reports with reference to yoga training intervention in reversing foot deformity and its associated symptom balance. Thus, the present study is taken.

## **Materials and Method**

The initial phase is the survey part of study to screen 460 students of school of mixed gender in the age range of 12-14 years among which 80 students of mixed were identified for foot deformity and subjects were categorized as per four types of foot deformity types such as Talipes Equines, Talipes Calcaneus, Talipes Varus and Talipes Vaglus (A. Anand & D. A. Sala, 2008).

The subjects were divided in two equal groups, i.e.  $n_1=40$  &  $n_2=40$  treated as Experimental group and Control group. The criteria for inclusion were the absence of any chronic disease except four types of foot deformities such as Talipes Equines, Talipes Calcaneus, Talipes Varus and Talipes Vaglus in them. There was no control on the daily diet of students.

The pre-post testing was done both groups were recorded at the onset of the study. Yoga intervention was given by competent male and female yoga instructors for training experimental group daily for 60 min duration, daily except Sunday for 8 weeks duration. The components of experimental intervention were as follows:

## Yoga Intervention

The yoga module comprises Yoga asana that has positive impact on foot deformities and its associated symptom balance. The following yogasanas are: - Common Yoga Practices with a positive impact on foot deformities associated symptom:- Pavanmuktasana, Viparitkarani, Halasana, Bhujangasana, Dhanurasana, Paschimottanasana, Ardha-Matsyendrasana, Shavasana, Kapalabhati and Anuloma-Viloma Pranayama. Gr.I: Walk-on toes (Talipes Equines) Adhomukha Swanasana, Akarna Dhanurasana, Padahastanasana, Ardha Cakrasana, Utthita Trikonasana and Virasana. Gr.II: Walk-on heels (Talipes Calcaneus) Vajrasana, Ushtrasana, Urdhvmukha-Swanasana Supta Vajrasana, Padangusthasana and Tadasana, Gr. III: Inward sole (Talipes Varus) Padmasana, Gomukhasana, Bhadrasana, Parivritta Trikonasana and Utthita Trikonasana. IV: Outward sole (Talipes Vaglus) Akarna Dhanurasana, Mandukasana, Ugrasana, Utthita Trikonasana, Prasaritha padottanasana. The participants of the control group were not given any such kind of practices and they continued their daily routine without any specific instruction.

## Instruments (Parameters)

The following instruments were used to assess and compare the impact of Yoga intervention. The selected parameters of foot deformity parameter were assessed by three methods. They are:-

1. Angular measurement of ankle from footprints, flexion, extension, adduction, and abduction measurement by Goniometer (Raymond J. Albensi, John Nyland, & David. N. M. Caborn (1999) and
2. Balance by Flamingo Balance Test (Nikolaos Tsigilis, Helen Douda, Savvas P. Tokmakidis, 2002)

All the parameters were recorded at the onset of the study in both the groups and similar parameters were again applied in both the groups after 8 weeks of experimental intervention.

## Statistical Analysis

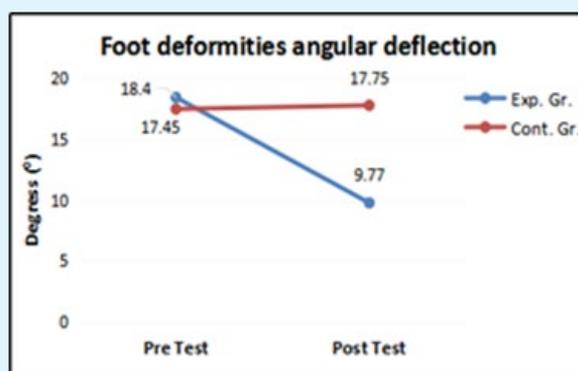
Pre and Post- intervention data obtained were analyzed to check for statistical significance using Paired Samples Statistics test and  $p < 0.05$  was accepted as significant difference between pre and post comparisons. The intragroup comparisons in both groups as

shown in Tables are as follows;

**Table 1** : Mean, S.D., and 't' value for angular deflection (Within Group)

Groups	Foot Deformities	Pre Test Mean ± SD	Post Test Mean ± SD	t-value
Exp. Gr. (n1=40)	Angular deflection (In degree0)	18.40° ± 2.07	9.77° ± 1.51	35.25*
Cont. Gr. (n2=40)	Angular deflection (In degree0)	17.45° ± 1.92	17.75° ± 1.91	-1.19

\*p<0.05



**Figure 1:** The Pre and Post-test Mean scores on foot deformities angular deflection (within Group)

The results of intergroup comparison on selected club foot deformities angular deflection scores showed significant change at 0.05 level, while the Control group did not show any change. This indicates 8 weeks of Yoga training has restored ideal ankle position. [Table 1 and Figure 1]

**Table 2** : Mean, S.D., and 't' value for balance (Within Group)

Groups	Foot Deformities associated symptoms	Pre Test Mean ± SD	Post Test Mean ± SD	t-value
Exp. Gr. (n1=40)	Balance	2.85 ± .75	5.41 ± 1.24	14.26*
Cont. Gr. (n2=40)	Balance	2.79 ± .51	2.72 ± .46	.167

\*p<0.05



**Figure 2** :The Pre and Post-test Mean value for scores on balance (within Group)

The results of intergroup further revealed that significant change in maintaining balance was found only in the Experimental group at 0.05 level. This suggests that that that Yoga training has enhanced balance of the students. [Table 2 and Figure 2]

## Results

The mean values as shown in the above table indicates that experimental group showed better balance and reduced angular deviation of foot. However, no such change was noticed in control group participants, although subjects were of both groups were in the state of homogeneity. The significant change in the experimental group exhibits the impact of experimental Yoga intervention.

## Discussion

The result indicates that the selected Yoga practices were found to be good to correct such foot defect (i.e., Talipes Equines or toe walking) and its associated symptoms. Thus the selected Yoga practices as mentioned in this study, seem to be appropriate to reverse toe walking.

Yoga practices induce an extension of the ankle joint for an ideal and healthy walking pattern. Yoga generates passive stretching of the ankle joint and therefore, better correction at the ankle joint was seen and ultimately helped to reduce Talipes Calcaneus related problems.

Yoga could help to improve a better walking style after making plausible correction of foot defects and its associated symptoms. Thus, as per the hypothesis- HO2: "There will be a significant effect of Yoga training on symptom associated with foot deformity" as formulated in this study has been evidenced statistically.

To summarize, this investigation, researcher has tried to correct four types of foot defects walking on toes (Talipes Equines), walking on heels (Talipes Calcaneus) walking

on Inward sole (Talipes Varus) and walking on outward sole (Talipes Vaglus) and its associated symptom balance by employing four different types of Yoga training. The result, finally, indicates that the four Yoga-training can judiciously be employed for correction of postural defects and its associated symptoms with special reference to four types of foot defects.

## Conclusion

The Present investigation concludes that, Yoga training is effective for correcting all four types of foot defects viz., Walking on toes (Talipes Equines), Walking on heels (Talipes Calcaneus), Walking on Inward sole (Talipes Varus) and Walking on outward sole (Talipes Vaglus) and significantly improve balance.

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