International Journal of Educational Research and Studies
www.journalofeducation.net
Online ISSN: 2664-6811, Print ISSN: 2664-6803
Received: 28-07-2021, Accepted: 12-08-2021, Published: 28-08-2021
Volume 3, Issue 3, 2021, Page No. 39-41

Effectiveness of foot intrinsic muscle strengthening exercises on foot function index in overweight individuals with flat feet: Pre-post experimental study

Simran Shaikh[1], Siddhi Tendulkar[2]
[1] Intern, Modern College of Physiotherapy, Pune, Maharashtra, India
[2] Assistant Professor, Modern College of Physiotherapy, Pune, Maharashtra, India

Abstract
Background: Flat feet is a common problem in overweight individuals. Due to increased weight, there is uneven distribution of weight on the foot which leads to various forms of foot pain, disability in young age which then causes number problems in further life. It causes problems throughout the skeletal structure.
Objectives: The aim of this study was to find the effect of foot intrinsic muscle strengthening exercises on foot function index in overweight individuals with flat feet.
Methods: 19 participants with flat feet between the age group 18-30 years were selected. The subjects were selected according to the inclusion and exclusion criteria. Navicular drop test was done prior to assess for flat feet. The protocol for strengthening exercises was started. Each participant was assessed for Foot Function Index and MMT on 1st day that is pre intervention, at 3rd week, and at 6th week that is post intervention.
Results: Mean values for Pre FFI was18.89 and mean value for Post FFI was 12.89. Statistical analysis for FFI showed p value <0.0001 which is extremely significant.
Conclusion: This study shows that foot intrinsic muscle strengthening exercises are effective in improving foot function index in overweight individuals with flat feet.

Keywords: flat feet, overweight, navicular drop test, FFI, MMT

Introduction

Flat foot also called Pes planus is a commonly observed disorder in clinical practice. It is a postural deformity in which the arches of the foot collapse [1]. Flatfoot is often a complex disorder with symptoms and varying degrees of deformity and disability [1].
The height of Medial Longitudinal Arch determines the degree of flat foot.[2]The medial longitudinal arch plays a role for shock attenuation and its flexible component enables proper function. Consequently, disorders of the medial longitudinal arch may affect foot function [3]. Flatfoot i.e. acquired flatfoot develops due to injury, prolonged stress to the foot, obesity, illness, faulty biomechanics [1]. The most common problems associated with Pes planus is excessive pronation during weight bearing activities [4]. Obesity and overweight during the developmental years are related to certain dimorphisms of the foot, in particular with the flat foot [5]. Various authors also have suggested that excessive increases in weight-bearing forces caused by overweight may negatively affect the lower limbs and feet [5]. According to existing literature, it is identified that increased foot pain could act as a limiting factor for obese individuals to participate in physical activity and in turn perpetuate the cycle of obesity, as a base of support during most weight-bearing activities is feet [5].
The presence of flat feet determined in obese subjects of 18-25 years is estimated to have 44% of overall prevalence [5]. When people have suffered from flatfoot for a long time without receiving proper treatment, the disorder may progress to several problems such as hallux valgus, plantar fasciitis, metatarsalgia, knee pain, back pain, knock-knee posture, achilles tendinitis [3].
Evidence suggests that strengthening intrinsic muscles enhances dynamic support of Medial longitudinal arch and foot stability [4]. Extrinsic and intrinsic foot muscles act as the main components of foot function and the intrinsic foot muscles are considered to have a more important role in dynamic foot control [4].

Need of Study

Many literatures have proved that flat foot leads to many complications in adulthood if not treated early. With the lowering of the arch there tends to be an excessive pulling of the plantar fascia, which leads to chronic heel and arch pain leading to plantar fasciitis. Common lower limb pathologies such as hallux valgus, plantar fasciitis, tibialis posterior dysfunction is associated with Pes planus [4]. High BMI causes increased loading on the foot during standing and walking, which in turn puts additional stresses on the soft tissues that support the joints within the foot [6]. Intrinsic foot muscles are important to maintain the foot arch, while gait loads are applied, and other studies have reported that strengthening exercises targeting these muscles are necessary to maintain and enhance foot function. Foot muscle strengthening exercises may reduce foot pain in overweight and obese patients [6]. For overweight and obese patients with decreased foot muscle strength specific exercises that target the

foot's intrinsic muscles are advised [6]. Hence there is a need to study the effect of intrinsic muscle strengthening exercises on obese individuals with flat foot.

Subjects

Included: Age – 18 to 30, individuals with Bilateral flat feet, both males and females, individuals with BMI>25. Excluded: Participants who have undergone recent hip, knee, ankle surgeries. Participants who have any foot, ankle, toe deformities except Flat foot. Any recent trauma to any LL and treated conservatively. Participants who use shoe modification and orthosis.

Materials

Sample size: 19
Study design: Pre- post experimental study
Sampling method: Purposive
Study population: Both males and females having BMI >25 with flat feet
Study setting: colleges in and around Pune
Materials required: pen, scale, ball, marbles, towel, paper
Outcome measure: Foot function index scale

Method

Various colleges were visited in and around the city. The participants were selected according to the inclusion and exclusion criteria. The participants were explained about the study before starting the procedure. Consent was taken from the subjects who wished to participate in the study. Before starting the procedure, BMI was assessed and those subjects who are overweight were included. Then navicular drop test was done to assess for flat foot. Foot function index was taken at the beginning at 3rd week and at the 6th week of the protocol. MMT for foot intrinsic muscles was performed at the beginning and even at the end of the protocol to see if the strengthening had an effect. In between 3 weeks they were again assessed for foot function index. The intervention of each exercise was of 3sets with 20 reps each and 30 sec rest period. Each participant was assessed on 1st day i.e. pre intervention and on 20th day i.e. at 3rd week, and again at 6thweek i.e. post intervention.

Protocol

Participants with FF was given a exercise program for 6 weeks of study period. The intervention was 5 times a week, with 3 sets of 20 repetitions with 30 sec rest period.

Exercise program included

1. Towel curls
2. Arch lifts
3. Toe Raisess
4. Ball roll exercise
5. Short foot exercise
6. Marble pickup exercise

Data Analysis

Table 1: Gender wise distribution

Gender	Total
Male	6
Female	12

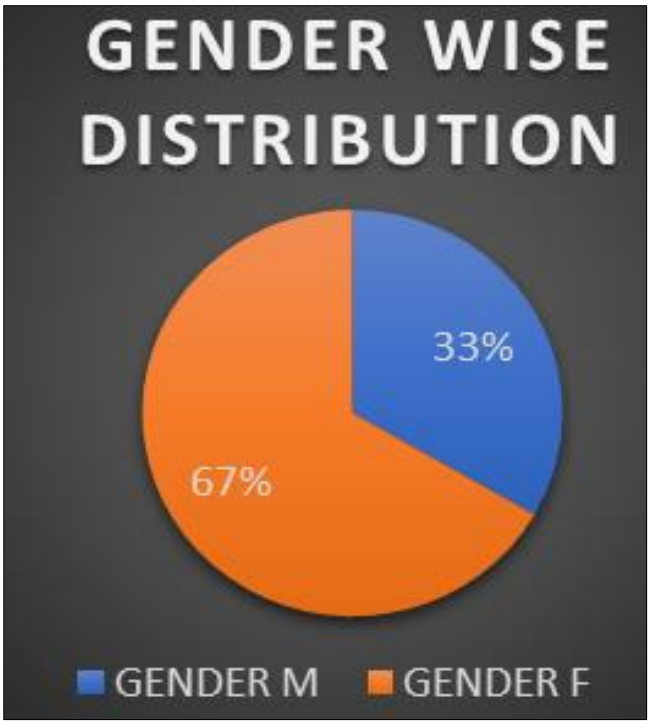

Fig 1

Table 2: Comparison of FFI

Outcome measure	PRE	After 3 weeks	Post 6 weeks
Mean	18.89	16.47	12.89
SD	6.86	5.82	5.13

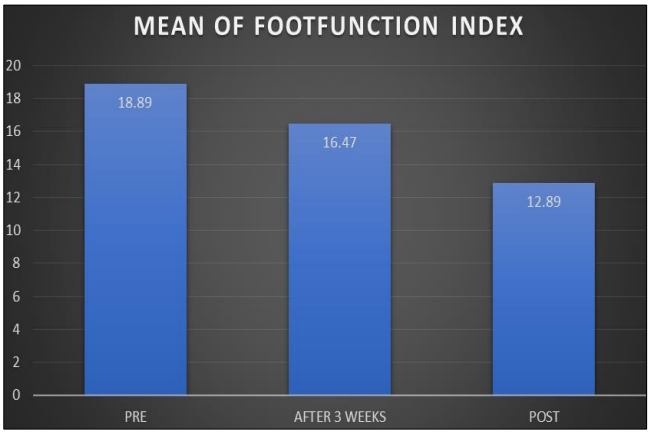

Fig 2

Table 3: Comparison of MMT

MMT	PRE	After 3 weeks	post 6 weeks
Mean	4.31	4.73	5

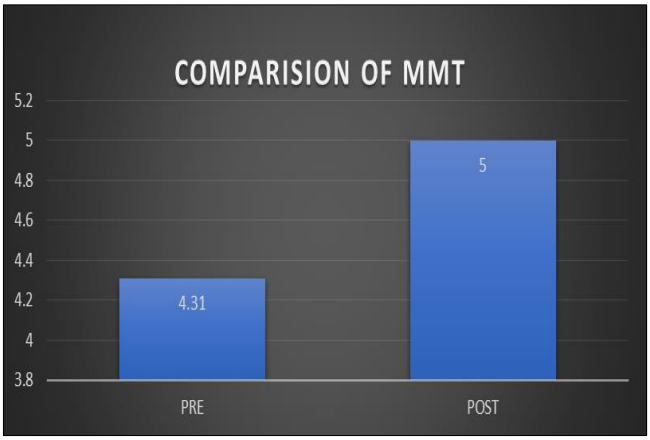

Fig 3

Table 4: Analysis of mmt of flexor hallucis longus and lumbricals

PRE		Post	
Left	Right	Left	Right
4.26	4.36	5	5

Table 5

	Left	Right
p value	0.0001	0.0001
T value	7.0993	5.5543

Result

The present study was conducted to study the effectiveness of foot intrinsic muscle strengthening exercises on foot function index in overweight individuals with flat feet. The difference between PRE, MID and POST 6 weeks were compared and analyzed using one way ANOVA test for the readings. Mean values for foot function index were 18.89, 16.47 and 12.89 for pre, mid and post intervention respectively. The statistical analysis shows that the t value for foot function index is 9.9645
The t value for MMT of flexor hallucis longus and lumbricals for right was 5.5543 and for left was 7.0993. The statistical analysis for foot function index and MMT shows that the p value is <0.0001 which is extremely significant.

Discussion

The objective of current study was whether 6 weeks of foot intrinsic muscle strengthening exercises were effective on foot function index in overweight individuals with flat feet. In this study, total 19 participants (both male and female) were included with the age group of 18-30 years old. Out of which 68% were females. The participants were selected according to the inclusion criteria and the protocol for strengthening of IFM were given.
The Pre and Post score analysis of foot function index was done which shows more significant values after 6 weeks, this shows that 6 weeks of foot intrinsic muscle training is more effective than 3 weeks. It was also observed that MMT was also improved clinically post 6 weeks of intervention but values of those was not considered statistically.

Conclusion

Hence, we can conclude that foot intrinsic muscle strengthening exercises are effective in improving foot function index in overweight individuals with flat feet.

References

1. Ashwini Chougala, Vidit Phanse, Erohit Khanna, Sudipta Panda. Screening of body mass index and functional flat foot in adults: An observational study. International Journal of Physiotherapy and Research, Int J Physiother Res,2015:3(3):1037-41.
2. Ashok Aenumulapalli1, manoj mohan kulk Arni 2, Achleshwar ramnarain Gandotra. Prevalance of flexible flat foot: A cross sectional study. Journal of Clinical and Diagnostic Research, 2017, 11.
3. Chutimon Panichawit, Sunee Bovonsunthonchai PhD. Effects of Foot Muscles Training on Plantar Pressure Distribution during Gait, Foot Muscle Strength, and Foot Function in Persons with Flexible Flatfoot; J Med Assoc Thai, 2015.
4. Effects of Short-Foot Exercises on Foot Posture, Pain, Disability and Plantar Pressure in Pes Planus" by Unver B, Erdem EU, Akbas E Journal of Sport Rehabilitation, 2019.
5. Shree Shyamal $ Thiyagarajan, Arulmani $ Kumar, Dhasarathi. Does obesity cause flat foot, 2018.
6. Barbara Boughton, The importance of obesity in foot pain management, 2016.
7. Cristina Gonzalez-Martin, Salvador Pita-Fernandez. Quality of life and functionality in patients with flat foot, 2018.
8. Miss. Tejashree Bhoir, Dr. Deepak B Anap. Prevalence of flat foot among 18-25 years old physiotherapy students: cross sectional study, Indian Journal of Basic and Applied Medical Research; September, 2014.
9. Dr. Siddhi S Tendulkar, Vaishali V Naik, Dr. Ujwal L Yeole, Effect of faradic stimulation vs. intrinsic muscle strengthening of foot in young individuals with flat feet International Journal of Physical Education, Sports and Health, 2018.