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Original Research

The Comparison Analysis Of Rigid And Soft Rigid Material Custom Foot Orthosis On Flat Foot Reduction

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ABSTRACT

Background: *The most frequent musculoskeletal problems, with the passage of time, are flatfoot. According to research, approximately 20–30% of all children in the globe have flat feet, and there are approximately 129 (40%) children that have a flat foot propensity, as determined by the findings of an examination conducted in Sukajadi District, Bandung. Prosthetic orthotics can give medial arch support with sponge and plastic materials in the treatment of flat feet, with the goal of providing support to the plantar foot and restoring the arch form of the foot.*

Methods: *This is a quasi-experimental study with only a two-group post-test design. This study compared two research groups: one with a rigid custom foot orthosis and one with a soft rigid custom foot orthosis.The total number of research samples is 26.*

Results: *The results of the Wilcoxon hypothesis analysis show that using a rigid custom foot orthosis reduces the degree of flat foot by 0.002 and using a soft rigid custom foot orthosis reduces the degree of flat foot by 0.059. As a result, when comparing the use of a rigid custom foot orthosis to the use of a soft rigid custom foot orthosis with the same intervention time in both groups of research subjects.*

Conclusion: *When compared to the use of a soft rigid custom foot orthosis with the same intervention period in both groups of research subjects, the use of a rigid custom foot orthosis is more able to minimize the degree of flat foot.*

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INTRODUCTION

When half or all of the foot is in contact with the ground, it is known as flat foot. Although most cases of flat foot are physiological, if the problem worsens, it can create symptoms and have an impact on the sufferer's foot function (Vadivelan, 2015). Flat foot is a condition in which the arch of the foot is hidden by adipose tissue and is not apparent from birth (Zaidah, 2019).

Congenital, ruptured posterior tibial tendon, post-trauma, inflammatory illness, and obesity are all reasons that contribute to flatfoot (Aulia, 2018). The line drawn

between the toes of both feet and the inner toe of the heel divides the flat foot into three degrees. Grade 1 feet have lateral foot support greater than half of the metatarsal support, grade 2 feet have no arch at all, and grade 3 feet have a laterally directed angle on the medial side of the foot (Antara, Adiputra, & Sugiritama, 2017).

The provision of treatment through the Orthotic Prosthetic Rehabilitation Unit is one of the approaches to treating flat feet. Foot orthotics are used to treat problems with flat feet. One of the most common therapies for diseases of the lower extremities is a foot orthosis (Hajizadeh, Desmyttere, Carmona, Bleau, & Begon, 2020). The design of the foot orthosis that is suited to the pathology has undergone a number of changes. This orthosis not only supports the arcus pedis, but it also reconstructs the structure of the foot to prevent irregularities in the bones, muscles, tendons, and ligaments (Putri, Sabita, & Nurseptiani, 2019).

Prosthetic orthotics can provide foot orthosis services in the form of medial arch support with sponge and plastic materials in the treatment of flat feet, with the goal of providing support to the plantar portion of the foot and restoring the arch form of the foot. Medial arch supports come in a wide range of styles and materials. The orthotist will be able to calculate the rigidity and material required for the tool's manufacturing by determining the desired function. The application of medial arch support will help to restore the medial longitudinal arch's arch form. The goal of employing a medial arch support is to repair and expand the medial longitudinal arch like a normal foot.

A rigid custom foot orthosis made of polyethylene (PE) plastic and a soft rigid custom foot orthosis made of EVA are two materials that can be used for this type of orthosis. Based on the findings of a study that was conducted by Utomo, Setyawan, & Fathi (2018), the findings revealed that employing medial arch support had an effect on reducing the degree of flatfoot in children aged 8 to 12. This study was carried out with the use of a soft medial arch support.

Various studies have been conducted to examine the effect of using rigid medial arch support and soft medial arch support on reducing the degree of flat foot experienced by patients, so the researcher's goal in this case is to conduct additional research on the effectiveness of reducing the degree of flat foot experienced by patients using custom foot orthoses, both rigid and soft rigid.

MATERIALS AND METHOD

This study used a quasi-experimental design with a two-group post-test design to see if there was a difference in the use of rigid custom foot orthoses versus soft rigid custom foot orthoses in flatfoot sufferers. The purpose of this study is to compare two research groups, one receiving rigid custom foot orthoses and the other receiving soft rigid custom foot orthoses. Students aged 8 to 12 years old, both male and female, from SD Negeri 1 Gedongan, Colomadu, and Karanganyar made up the study's population of 62 students.

The sample size in this study was 26 samples, and the sampling method was purposive sampling with specific criteria. 26 children were identified as having flat feet based on data retrieved through foot printing on paper. The 26 individuals will then be separated into two groups, with each group receiving intervention in the form of rigid custom foot orthotics and soft rigid custom foot orthotics for one month, with every two weeks being monitored.

RESULTS

Students in grades 2-4 at SD Negeri 1 Gedongan, Colomadu, Karanganyar made up the study's population. 26 children were identified as having flat feet based on data retrieved through foot printing on paper media. The 26 individuals will then be separated into two groups, with each group receiving intervention in the form of a rigid custom foot orthosis or a soft rigid custom foot orthosis for one month, with every two weeks being monitored.

Table 1. Frequency Distribution of Research Samples

Frequency	N	%
Gender		
Male	9	60
Female	6	40
Grade		
2	6	24
3	10	38
4	10	38
Flat foot condition		
Right	11	42
Left	15	58

The male sex was discovered to be more than the female sex based on the gender of the research subjects. The average age of the research sample was between grades of two and four. Then, in order to meet the study's goal of determining the efficiency of foot orthotics in terms of material, all participants who had flat feet were included in the study.

Table 2. Flat Foot Sample Degrees

Flat Foot degrees	**Count of Subject Feet**	**Prosentase (%)**
Grade 1	2	7
Grade 2	8	31
Grade 3	16	62
Total	**26**	**100 %**

According to the table above, 2 (7 percent) of the 26 research subjects had flat feet of grade 1, 8 (31 percent) had flat feet of grade 2, and 16 (62 percent) had flat feet of grade 3.

Table 3. Flatfoot Degree Data Before and After Intervention

Test	N	Min	Maks	Mean	Std. deviation
Pre Test					
Rigid custom foot orthosis	13	2	3	3	0,4803
Soft rigid custom foot orthosis	13	1	3	2	0,7679
Post Test					
Rigid custom foot othosis	13	l	3	2	0,9035
Soft rigid custom foot orthosis	13	1	3	2	0,8164

The data was derived from the outcomes of evaluating the degree of flatfoot utilizing a foot print on each group of research volunteers over a one-month intervention period.

Table 4. Normality test

Intervention	Sig. *Shapiro-Wilk*	Info
Pre	0,000	Not typical
Post	0,012	Not typical

The data is not regularly distributed, as determined by the normality test of the test findings. A non-parametric test, the Wilcoxon test, was used to examine the difference in the degree of flat foot reduction in the second treatment utilizing a soft rigid custom foot orthosis.

Table 5. Hypotheses Test

Variable	N	Mean Rank	Sum of Ranks
Soft material			
Negative Ranks	11[a]	6,00	66,00
Positive Ranks	0[b]	00,00	00,00
Ties	2[c]		
Total	13		
Z	-3.025[a]		
Asymp. Sig. (2-tailed)	0,002		
Rigid material			
Negative Ranks	4[a]	2,50	10,00
Positive Ranks	0[b]	00,00	00,00
Ties	9[c]		
Total	13		
Z	-1.890[a]		
Asymp. Sig. (2-tailed)	0,059		

Both custom foot orthoses give significant effects in lowering the degree of flatfoot, according to the hypothesis test results. When compared to the use of a soft rigid custom foot orthosis with the same intervention time, the use of a rigid custom foot orthosis was more effective in reducing the degree of flat foot in both groups of study subjects.

DISCUSSION

The results of early detection utilizing the foot print method on 62 students in grades 2, 3, and 4 provided primary data on subjects who suffered from flat feet. 26 students suffered flat foot out of all those who participated in early detection, and they were all utilized as research subjects since they all met the study's inclusion and exclusion criteria, with male sex accounting for 60% of the students and female sex accounting for 40%. The findings of this investigation support Lendra's viewpoint & Santoso, 2009, boys are more common than girls to have flat feet, with a prevalence of flat feet in boys reaching 52 percent and 36 percent, in girls.

The primary data for the research subject criterion is derived from the results of actual measurements on the research subject. Students in elementary school (SD) ranging in age from 8 to 12 years old were used as research subjects. This is consistent

with Siswanti's hypothesis (Siswiyanti, Susilowati, & Pudjiastuti, 2013) that the age range of 7 to 9 years is included in late childhood, which has immense potential for optimizing all aspects of development, including motor skill development.

Between the ages of 7 and 12, children's motor skills enter the period of specialized skills, when they master their motor skills and achieve optimal motor development. Furthermore, this theory is consistent with Fajar's theory (Fajar & Permana, 2013). According to this study, motor skills have a significant impact on a child's growth.

If a child's motor skills are delayed, he or she may experience developmental delays and growth, which will affect functional abilities, particularly mobility abilities such as balance, risk of falling, and walking speed (Aktifah, Nurseptiani, & Zainita, 2021). During a child's growth and development, the soft tissue on the inside side (medial) of the soles of the child's foot thickens; however, this scenario will improve as the child grows. Flat foot is one of the conditions that can make walking difficult (Siswiyanti et al., 2013).

Subjects with flat feet were given an intervention in this study by wearing rigid custom foot orthoses and soft rigid custom foot orthoses for one month and then observing the degree of flat foot in each group of research subjects after the intervention. This intervention was offered because foot orthoses (FOs) are a popular treatment for a variety of lower extremity problems. The degree of flat foot post intervention data obtained is primary data obtained from the findings of foot prints that were taken again in both groups of research subjects using paper and ink media to see the state of the research subject's foot after a month of intervention.

The use of the foot print test to detect flat feet is in line with what was done by Ayu Juni Antar, Satria Nugraha, & Trisna Narta Dewi, (2019) in "Physiotherapy Services for Examination of the Shape of the Arch Pedis (Normal Foot, Flat Foot, and Cavus Foot) and Examination of Walking Patterns (Stride Length, Step Length, Cadence, and Speed) in Children at SDN 8 Dauh Puri Denpasar," they wrote in their study paper. The main formula for determining the status of the flat foot in this study is based on this method. According to the hypothesis proposed, the degree of flat foot is categorized into normal, degree 1, degree 2, and degree 3 based on the findings of the foot print test (Pourghasem, Kamali, Farsi, & Soltanpour, 2016) on the types of degrees of flat foot in humans.

When comparing the use of a rigid custom foot orthosis made of Plastic PE material to the use of a soft rigid custom foot orthosis, the authors' findings reveal that the use of a rigid custom foot orthosis made of Plastic PE material has a better effect in reducing the degree of flat foot. This is consistent with what was stated by Siswiyanti et al., (2013), that the rigidity of the 2 mm PE plastic material is higher. Furthermore, in the study done by Dutton (2011), in terms of materials, he also stated that the usage of firm or rigid materials is better for correction and movement control.

A custom foot orthosis can help with weight transfer, flexible disability stabilization, and aberrant movement management. As a result, using a more rigid custom foot orthosis will help reduce the degree of flatfoot more effectively than using a soft material custom foot orthosis.

CONCLUSION

In the year 2021, this study was carried out at SDN 1 Gedongan. In this study, data on the degree of flatfoot was collected from 26 research subjects aged 8 to 12 years

old in classes 2 to 4 of elementary school, both male and female. The Wilcoxon test was employed since the data was not normally distributed, as determined by the results of the data normality test.

According to the results of the Wilcoxon data test, there is a reduction in the degree of flat foot with the use of a rigid custom foot orthosis with a P value of 0.002 and a reduction in the degree of flat foot with the use of a soft rigid custom foot orthosis with a P value of 0.059. As a result, when comparing the use of a rigid custom foot orthosis to the use of a soft rigid custom foot orthosis with the same intervention time in both groups of research subjects, it can be concluded that the use of a rigid custom foot orthosis is more effective in reducing the degree of flat foot.

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