

Correlation Between Agility and Flat Feet in Children 5–6 Years Old

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Abstract: Flat feet is one of the factors that influence growth and the development process. The present study aims to investigate the correlation between medial longitudinal arch, and age and agility. Observational analytic design was performed in this study, which took place in Khoirunnas Nurul Hayat kinder garten. The population in this study was 32 children aged 5–6 years old. The sampling technique used in this study was total sampling. An examination of flat-foot level was done on the medial longitudinal arch using Clarke's angle following which 11 children were selected as the subjects of this research. To measure agility, we used a 30-meter shuttle run test. Data analysis was performed with a Spearman's rho, which produced a p-value of 0.603. The conclusion of this research is that there is no correlation between medial longitudinal arch and agility.

1 INTRODUCTION

Flat feet (pes planus) is a condition in which the longitudinal arch of the foot collapses. Flat feet is categorized into two conditions : physiological and pathological (Atik dan Ozyurek, 2014). A physiological flat-foot condition is a common structural deformity in children and occurs in the first year of life. If this deformity continues into adulthood, it may be defined as a pathological condition, with a prevalence of 3% in the adult population (Sonia et al., 2015). Babies' and toddlers' foot shape tends to be flat due to fat accumulation in the medial longitudinal arch. This structure will disappear and become a normal shape with age. Generally, the foot arch will be formed between the ages of two and five years old (Halabchi et al., 2013).

The pedis arch will turn into a proportional curve during adolescence. Based on a survey of 297 school children in Allahabad, India, over 40.32% of children under five years, 22.15% of children between five and ten years, and 15.48% of children

of more than ten years have bilateral flat feet (Darwis, 2016).

Agility is an ability to change the direction of movement quickly and precisely while moving without balance loss and awareness of position, and is affected by muscle strength, flexibility, balance, and neuromuscular coordination (Harsono, 2001). Agility has a relation to body movement that involves foot movement and rapid changes of body position related to the pedis arch (Sugiharto, 2012). Children who have good agility will be able to perform more effective and efficient movement.

Knowledge of the medial longitudinal arch and agility has great importance in giving an overview of gross motor development in children. The current study examines the correlation between the longitudinal arch and agility in children aged 5–6 years old.

2 METHODS

This study was an observational analytic research that aimed to understand the correlation between the

medial longitudinal arch and agility. The research was conducted at Khoirunnas Nurul Hayat kindergarten in Surabaya, which consisted of group A and group B with 75 children in total. The research subjects were obtained using a total sampling technique which previously has been done flat feet examination and obtained by 11 children were chosen as the subjects for this study.

The medial longitudinal arch examination in this study used a wet footprint test (Idris, 2010; Lutfie, 2007). In this test, the shape of the foot arch was identified by soaking the foot in ink, then putting it on a sheet of paper so that a foot print would be left on it (Miller, 2010).



Table 1: Average and standard deviation values of the research subjects' characteristics.

Parameter	Clarke Index
Obtained from:	Footprint
Instrument	Conventional podoscope, ink foot print and photo podogram
Definition	Objective method for measuring internal longitudinal arch
Method	Angle between line A, which joins the more internal point of the fore foot and the more internal point of the rear foot, with line B, which joins the more internal point of the forefoot with the deeper part of the footprint
Criteria	<ul style="list-style-type: none"> Clarke angle < 31°: Tendency to flatness and/or pronation Clarke angle >31°–45°: Normality range Clarke angle > 45°: Tendency to cavus foot



2.1 Measurement of Agility Using a Shuttle Run Test

The respondents' agility was measured using a shuttle run test. This test began with the participant standing on the starting line and listening for the signal. Following the "yes" command, the child started to run to another line that was 30 meters away. The child touched that line by hand, then ran back to the starting point. The success of this test was determined by time. Thus, the shorter the time gained, the better the result (Gilang, 2009).

Table 2: Agility category and value (Nafi'ah, 2015).

Category	Time	
	Male	Female
Very low	≥13.0 seconds	≥13.9 seconds
Low	12.3–12.9 seconds	13.1–13.8 seconds
Moderate	11.8–12.2 seconds	12.5–13.0 seconds
Good	11.2–11.7 seconds	11.9–12.4 seconds
Very good	≤11.1 seconds	≤11.8 seconds

3 RESULTS

3.1 Results Based on Respondents' Characteristics

3.1.1 Respondents' Age

Table 3: Respondents' age.

No.	Age	Number of people	Percentage
1	5 years	6	55%
2	6 years	5	45%
Total		11	100%

Based on the above characteristics, most of the respondents (55%) were 5 years old, while a smaller proportion (45%) were 6 years old.

3.1.2 Respondents' Characteristics with Regard to Medial Longitudinal Arch

Table 4: Respondents' characteristics with regard to medial longitudinal arch.

Medial longitudinal arch	Number of people	Percentage
0–4°	5	45%
5–8°	2	18%
9–12°	2	18%
13–16°	0	0%
17–20°	2	18%
Total	11	100%

As table 4 demonstrates, most of the respondents (45%) had a medial longitudinal arch of 0–4°, while two respondents (18%) had medial longitudinal arches of 5–8°, 9–12°, and 17–20° respectively.

3.2 Correlation Between Medial Longitudinal Arch, Age and Agility

Table 5: Correlation between medial longitudinal arch, age and agility.

	Age	Agility
Medial Longitudinal Arch	0.232	0.603

The test of the correlation between medial longitudinal arch, and age and agility resulted $p=0.232$ for age and $p=0.603$ for agility.

4 DISCUSSION

The results showed that all students (100%) of TK Khoirunnas Nurul Hayat in Surabaya aged 5–6 years with the condition of flat feet were categorized as having very low agility.

Children at the age of 5–6 years are at the proficient stage (advanced stage) of the fundamental movement phase, characterized by efficient, coordinated, and well-controlled movement. At this stage the child needs more balance and coordination as a motion control factor. As for the aspect of agility is needed at the next stage of development (Gallahue et al., 2012)

Research conducted by Sahri (2017) on the relationship between the foot arch and agility in first-, second-, and third-grade students obtained a p -value of 0.025, and thus concluded that there is a relationship between the foot arch and agility. This is in line with research conducted by Pirani et al. (2011) on the influence of flat feet on physical

ability. It shows that the foot is the last part of the kinematic chain and has a critical role in static and dynamic positions. So when part of the chain is weakened or damaged, it affects the other parts of the kinematic chain. People with flat feet have problems with weight transfer, shock absorption, and pressure distribution, which may increase their energy consumption and thereby affect their personal physical ability (Darwis, 2016).

However, a statistical test using Spearman's rho obtained a p -value of 0.603, so it can be concluded that there is no correlation between medial longitudinal arch and agility. This result is in line with a study conducted by Darwis (2016) that compared agility between people with normal feet and those with flat feet, which obtained a weak correlation result. According to Sahri (2017), not all flat-foot conditions cause someone to experience agility disorder. The other factors that affect agility are anthropometry, age, sex, and weight.

5 CONCLUSION

According to the result analysis and discussion, it may be concluded that all respondents (11 children or 100%) who had an imperfect medial longitudinal arch were categorized as having very low agility. However, the statistical result found that there is no correlation between medial longitudinal arch and agility.

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