

## Relationship between practical skill and the medial longitudinal arch of the foot in primary school-aged footballers

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### Abstract

When the arch sedimentation rate, an index of the medial longitudinal arch of the foot is large in primary school-aged footballers, there is often a defect in some part of the foot.

The association between the arch drop ratio and amount of soccer played was examined in this study. The subjects were 99 primary school-aged footballers who were found to be without abnormality following a medical examination by a physician. They were 11-12 years old. A questionnaire survey was implemented about exercise time per day and the number of games per month. The arch drop ratio was significantly larger in the group that played soccer frequently than in the group that played infrequently. It is necessary to warn enforcement of the soccer of the primary school-aged not to become the overwork.

**Key Words:** static index, arch ratio, practical skill, dynamic index, arch drop ratio, primary school-aged footballer, ankle/foot pain

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### Introduction

We studied the medial longitudinal arch of the foot (MLA) in primary school-aged footballers. The arch drop ratio, which expresses the rate of change of MLA under load, was proved to shrink with age. These results also show that MLA becomes strong functionally as the foot grows with age. When the arch drop ratio grows big during the normal development process, resistance to load decreases. Consequently, pain and disorders of the foot are common. In this study, the association between arch drop

ratio and amount of soccer played was examined.

### Materials & Methods

The subjects were 99 primary school-aged footballers who were found to be without abnormality following a medical examination by a physician. They were 11-12 years old. The arch drop ratio, which expresses the change of MLA with load, was used as an index of MLA. The height from the sole side to the tubercle of the scaphoid bone was defined as the navicular height. The arch

ratio was defined as the ratio of foot length to navicular height. The difference between the non-weight-bearing arch ratio and the weight-bearing arch Ratio was defined as the arch drop ratio. The non-load position was measured in a sitting position. The load position was measured while standing on a single leg. The statistical analysis used the Mann-Whitney U test.

## Results

Regarding exercise time per day, 36 boys (41.9%) had less than 2 hours and 50 boys (58.1%) had over 2 hours. Regarding the number of games in one month, 27 (32.1%) boys had less than three, and 57 (67.9%) boys had more than three. The arch drop ratio of the group with less than two hours of exercise time was  $1.8 \pm 1.0\%$ . In contrast, the arch drop ratio of the group with more two hours of exercise was significantly larger with  $2.2 \pm 1.2\%$  ( $p = 0.025$ ). The arch drop ratio of the group where was with or less of three times of number of games was  $1.5 \pm 1.1\%$ . In contrast, the arch drop ratio of the group that had more three games per month was significantly large with  $2.2 \pm 1.0\%$  ( $p = 0.004$ ). The arch drop ratio of the group with much number of exercise time or games.

## Discussion

Joint hypermobility in athletes may be an underlying factor contributing to lower extremity joint injuries and disorders. A joint is typically classified as hypermobile if its range of motion exceeds normal limits, taking into account age, sex, and ethnicity [1]. Joint hypermobility occurs most often in children and diminishes with age [1]. Joint mobility is highest at birth, decreases in children around 9 to 12 years of age, peaks again in adolescent girls around the age of 15 years, and decreases in both sexes for the remainder of the lifespan [2]. Researchers have suggested that the peak at 15 years in adolescent girls is due to hormonal changes that occur in puberty, such as the release of the hormone relaxin [2]. Between 5% and 12% of individuals have some form of joint hypermobility [1,2], and it is 3 times more common in females than in males [3]. Our results regarding the medial longitudinal arch of the foot of the primary school-aged

footballers suggest that the rigidity of many joints of the foot increases with the growth of the foot.

The complex ligamentous, tendinous, and muscular articulations of the foot and ankle are important joint components that may be factors in lower extremity injuries [4]. Pes planus may be a predisposing condition for the development of stress fractures. Metatarsal stress fractures, which originally most commonly occurred in military service members and were nicknamed "march fractures," have increased in prevalence among athletes, most notably long-distance runners, dancers, and jumping-sport athletes [5,6].

When the arch drop ratio is large in primary school-aged footballers, pain and disorders of the foot increase. The observation that we previously obtained is concordant with the findings mentioned above. In this study, the arch drop ratio was significantly large in the group that played more soccer. These findings suggest that the rigidity of the foot is not determined only by the degree of personal individual physical growth, and the rigidity decreases if momentum becomes excessively heavy.

Medial collapse can result in increased incidence of stress fractures in the metatarsal bones, as well as problems with force distribution and dissipation when measured dynamically in individuals with pes planus [7]. Clinically, the athlete with joint hypermobility may benefit from the use of orthoses as a corrective measure for pes planus to offset this medial collapse. Hockenbury [8] showed that the use of orthoses reduced the incidence of metatarsal stress fractures in military recruits with pes planus. Brophy et al [9] drew a similar conclusion after examining 44 National Football League athletes and finding a correlation between increased medial forefoot pressure and the development of turf toe. Unlike adults, the primary school child who is in the process of growth should take part in soccer only to a degree at which the rigidity of the foot is not affected. Thereby, problems with the foot can be prevented.

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