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The bimodal distribution of foot arch index and its application

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Flatfeet are common physiological deviations in young children, and the treatment of flatfeet remains controversial. The bimodal frequency distribution of foot arch index, which was found in our previous research, gave a new natural definition for flatfeet. Based on the new definition, the purpose of this research was to characterize foot arch development in contrast to body growth and identify associated factors. The Chippaux-Smirak index (CSI) of footprints was used as a foot arch index. In a prospective longitudinal study of body structure and physical fitness, two surveys of 572 children were conducted during their first year at their elementary school and 1.5 years later. In the 263 children who had flatfeet at the first survey, 70 (27%) developed their foot arches (mean CSI from 0.72 to 0.46). The rest presented little change (mean CSI from 0.75 to 0.75). Improving one leg balance and changing into smaller CSI were significantly associated with foot arch development, but sex and weight were not. In the 288 non-flatfooted children at the first survey, only 9 children (3%) changed to flatfooted. The bimodal distribution, all-or-none changes, and unidirectional change at different ages in foot arch index indicated that foot arches are not direct results of body growth. Significant relationship to one leg balance ability suggests a motor control associated with biomechanical stability of the ankle should underlie foot arch development.

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