

A Convolution Neural Network Approach to Predict Pes-Planus Using Plantar Pressure Mapping Images

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Abstract : Background: Plantar pressure distribution measurement has been used for a long time to assess foot disorders. Plantar pressure is an important component affecting the foot and ankle function and Changes in plantar pressure distribution could indicate various foot and ankle disorders. Morphologic and mechanical properties of the foot may be important factors affecting the plantar pressure distribution. Accurate and early measurement may help to reduce the prevalence of pes planus. With recent developments in technology, new techniques such as machine learning have been used to assist clinicians in predicting patients with foot disorders. Significance of the study: This study proposes a neural network learning-based flat foot classification methodology using static foot pressure distribution. Methodologies: Data were collected from 895 patients who were referred to a foot clinic due to foot disorders. Patients with pes planus were labeled by an experienced physician based on clinical examination. Then all subjects (with and without pes planus) were evaluated for static plantar pressures distribution. Patients who were diagnosed with the flat foot in both feet were included in the study. In the next step, the leg length was normalized and the network was trained for plantar pressure mapping images. Findings: From a total of 895 image data, 581 were labeled as pes planus. A computational neural network (CNN) ran to evaluate the performance of the proposed model. The prediction accuracy of the basic CNN-based model was performed and the prediction model was derived through the proposed methodology. In the basic CNN model, the training accuracy was 79.14%, and the test accuracy was 72.09%. Conclusion: This model can be easily and simply used by patients with pes planus and doctors to predict the classification of pes planus and prescreen for possible musculoskeletal disorders related to this condition. However, more models need to be considered and compared for higher accuracy.

Keywords : foot disorder, machine learning, neural network, pes planus

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