Original Research Article

Comparison of Direct Versus Image Based Foot Posture Index in School Going Children

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ABSTRACT

Introduction: The Foot Posture Index-6 (FPI-6) is a simple quantification tool to assess static foot alignment in children. Palpation of the foot is required for assessment of one of the six criteria that comprise the FPI-6; the remaining five criteria may be evaluated using still-frame photographs. Using only the image-based criteria may allow evaluation of foot posture without going in person for physical checkup. The purpose of the current study was to compare this image based criteria of FPI with direct observation FPI in school going children.

Methods/Procedure: 38 participants were assessed from different schools of Ahmedabad for the study. Children were evaluated for FPI and scoring of five criteria were done. Three photos with a camera of the medial longitudinal arch, posterior ankle and the talonavicular joint approximately 45° from the posterior calcaneus for both right and left feet were taken. Then assessment of the five image-based criteria of the FPI-6 for both feet were done and scoring was done.

Results: As this is a comparison of two methods, Bland Altman analysis has been performed and bias is almost negligible (mean bias for Lt. FPI – 0.16 and for Rt. FPI 0.03) so both methods are equivalent.

Conclusion: Image based FPI evaluation can be done with caution to assess foot posture evaluation in school going children which can be very useful in current pandemic situation.

Keywords: Image based Foot Posture Index, Foot Posture Index, School Going Children

INTRODUCTION

The Foot Posture Index (FPI) is an observational measurement instrument that takes into account the three-dimensional nature of foot posture. FPI is simple and inexpensive tool for measurement of static foot alignment. It has been shown to achieve good reliability in adults and in children.[1]

The FPI-6 consists of six individual criteria. The rear foot is assessed via palpation of the head of the talus, observation of the curves above and below the lateral malleoli and the extent of the inversion/eversion of the calcaneus. The observations of the forefoot consist of assessing the bulge in the region of the talo-navicular joint, the congruence of the medial longitudinal arch and the extent of abduction/adduction of the forefoot on the rearfoot.[2] Each criteria have 5-point scale that ranges from −2 to +2, with negative numbers indicating a more supinated foot posture and positive numbers indicating a more pronated foot posture.[3] A composite FPI-6 score ranges from −12 to +12, and a foot type is classified as a highly pronated posture with a score of 10 or greater, a pronated posture with scores of +6 to +9, normal posture with scores of 0 to +5, a supinated posture with scores of −4 to −1, or a highly supinated posture with ≤ -5.[1,2,4]

Palpation of the foot and therefore direct contact is required for assessment of one of the six criteria that comprise the FPI-6; The remaining five criteria of the FPI-6

are evaluated based on visual observations of the rear foot, midfoot, and forefoot. These remaining five criteria may be evaluated using still-frame photographs. Using only the image-based criteria may allow evaluation of foot posture without going in person for physical checkup. Furthermore it will allow multiple clinicians to evaluate large groups of patients quickly. Reliability using only these five image-based criteria has been studied and excellent inter rater as well as moderate intrarater reliability was found. [5] Knowledge of foot posture in typically developing children helps to outline rehabilitation strategies most appropriate for the affected children as well as to monitor the progress with intervention.[6,7] Current Era has already accelerated use of remote services including physiotherapy assessment and treatment services. Above this covid-19 has created need for safer health services options. So present study is done to evaluate possibility of use of image based assessment of foot posture. If both of these methods are comparable then it will provide criterion validity of Image based FPI. This Image based observation of foot posture will save timings for assessment and will provide safe measure in terms of pandemic type of situation. Furthermore, It will allow multiple clinicians to evaluate larger group of children or patients simultaneously.

METHODS
Ethical approval was taken from institutional ethics committee.
Study Design: cross sectional study
Sampling Method: convenient sampling
Study Population: 38 School going children (Total 40 students, 2 excluded) from different areas of Ahmedabad, India.

Selection Criteria:

Inclusion criteria:
- Apparently healthy children of both genders (girls and boys)
- Age group between 6-12 years

Exclusion criteria:
- Children with congenital malformation
- History of lower limb surgery
- Neuromuscular or musculoskeletal abnormalities that may affect unsupported standing

Procedure:
A brief description of the procedure given to children after their initial assessment of age, gender, weight and height. Participants were asked to take five or more steps of marching on the spot and stand in a relaxed stance with arms by the side, and looking straight ahead. Child made to rest in a comfortable standing position with arms by their sides and looking straight ahead. After those children were evaluated for foot posture index and scoring of five criteria were done. Participants maintained this comfortable stance position and three photos of the medial longitudinal arch, posterior ankle, and talonavicular joint for both right and left feet with a digital camera or mobile camera were taken. The camera was positioned approximately 30cm from the medial side of the foot for the medial longitudinal arch, approximately 25 cm from the posterior aspect of the calcaneus for the posterior ankle view, as well as 25 cm from the talonavicular joint and approximately 45° from the posterior calcaneus for the talonavicular joint view. Then scoring of the five image-based criteria of the FPI-6 for both feet were done using these photographs. Each criterion was scored from -2 to +2, with a total FPI score ranging from -10 to +10 [5]

Figure1. Images of medial longitudinal arch, posterior ankle and talonavicular joint view

RESULTS

The current study was done to compare Image based criteria of FPI with direct observation of FPI in school going children. Total 38 students were assessed from which 21 were boys and 17 were girls.

Table 1: Gender Distribution

| Boys	Girls	Total
21	17	38
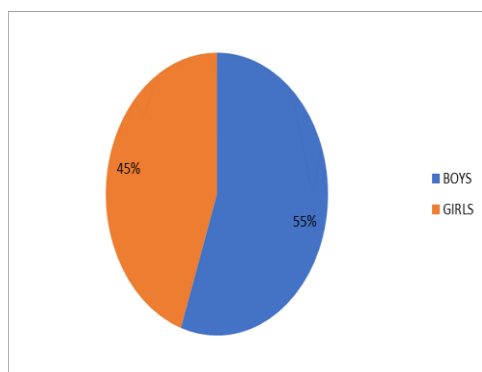
Graph 1 Gender Distribution

Data collection of direct and image based FPI for left and right feet were done. Mean and standard deviation for both these methods were calculated.

Table 2 : Average Scores (Mean±Sd) For Direct And Image Based Fpi (Scoring Of Five Observational Criteria)

	Left FPI (MEAN±SD)	Right FPI (MEAN±SD)
Direct FPI	2.31±0.84	2.78±0.90
Image Based FPI	2.47±0.68	2.76±0.88

After completion of data collection statistical analysis was done. As this is a comparison of two methods, Bland Altman analysis has been performed using MedCalc software and bias is almost negligible. Mean bias for Lt. FPI is − 0.16 and for Rt. FPI is 0.03 so both methods are equivalent.
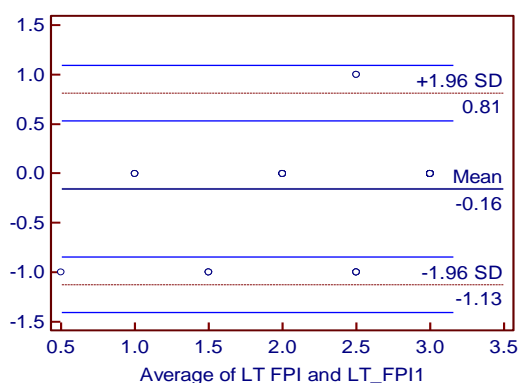
Graph 2 Bland Altman Analysis of Left FPI
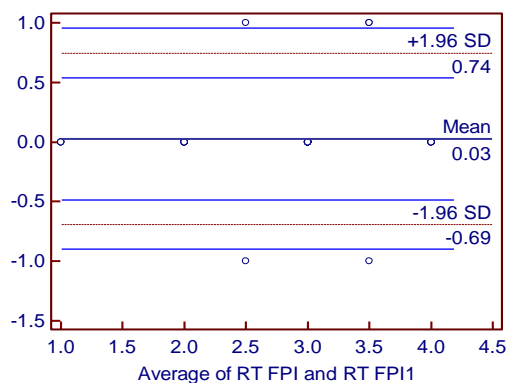
Graph 3 Bland Altman Analysis of Right Fpi

DISCUSSION

Present study analyzed comparison of Image based criteria of FPI with direct observation of FPI in school going children. Results of comparison found both the methods almost equivalent and supported use of Image based evaluation of FPI in children.

This study included only school going children and included both genders. For data collection, all the photographs were taken from similar angles so that there will be only minor difference of images. Due to convenient sampling there was no equal distribution of all foot types. In future researches equal distribution of foot types can be considered. Use of tripod to take images will minimize any difference of images.

Reliability and validity of FPI is already established by researchers. FPI-6 is said to have moderate to good inter-rater (0.62 to 0.91) and intra-rater (0.81 to 0.91) reliability as well as instrument validity (64%) in measuring foot posture.[1,4,8] Reliability of FPI-6 in adults and paediatric population is also supported by other researchers.[9,10,11,12] Excellent intra-rater and poor to moderate inter-rater reliability has been also established using only the five image-based criteria of the FPI-6.[5] However use of interpretation of Foot posture from five image based criteria should be cautious and careful due to poor to moderate interrater reliability. This explains almost similar results of foot posture assessment with direct and image based methods.

Previous studies provide good internal construct validity of actual FPI-6,[4,13,14] results of present study provides criterion validity of five image based criteria. So considering all these researches, use of image based criteria for evaluation of foot posture with caution will be helpful in remote assessment of foot posture.

CONCLUSION

Image based FPI evaluation can be done with caution to assess foot posture evaluation in school going children which can be very useful in assessing large population as well as in current pandemic situation. This will be also helpful in providing assessment through remote services.

Future studies can be done to establish appropriate cutoff values and normative values for the FPI composite scores of image based criteria with larger sample sizes.

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