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ORIGINAL ARTICLE

Are Static Foot Posture Measures Related to Static and Dynamic Plantar Pressure Parameters?

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Background: A few studies have investigated the relationship between foot posture measures and plantar pressure parameters, but no study has investigated the correlation of foot posture measures with all primary parameters consisting of contact area (CA), maximum force (MF), and peak pressure (PP). We aimed to determine the relationship of Foot Posture Index-6 (FPI-6) and navicular drop (ND) with plantar pressure parameters during static standing and preferred walking.

Methods: Seventy people were included. ND and FPI-6 were used to assess foot posture. Plantar pressure parameters including CA, MF, and PP were recorded by a pressure-sensitive mat during barefoot standing and barefoot walking at preferred speed. All assessments were repeated three times and averaged. Pearson correlation coefficients below 0.300 were accepted as negligible and higher ones were interpreted.

Results: ND was moderately correlated with dynamic CA under the midfoot and second metatarsal (M2), also FPI-6 was moderately correlated with dynamic CA under the midfoot (0.500<r<0.700). The other interpreted correlations were poor (0.300<r<0.500). Both measures were correlated with dynamic CA under the M2 and M3, dynamic CA and MF under the midfoot, and static CA, MF, and PP under the M1 and hallux (p<0.01). ND was also correlated with dynamic MF under the M1 and dynamic CA under the M4 (p<0.01). Further, ND was

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correlated with static CA and PP under the M2 also static PP under the M5 (p<0.01). FPI-6 was also correlated with dynamic MF and PP under the hallux (p<0.01).

Conclusions: The correlations between foot posture measures and plantar pressure variables are poor to moderate. The measures may be useful in the clinical assessment of medial forefoot problems related to prolonged standing and midfoot complaints related to high force during walking. Further, FPI-6 may provide valuable data regarding hallux complaints related to the high loads during walking.

Foot posture is generally classified as pronated foot, neutral foot, or supinated foot (1). Foot posture is frequently associated with lower limb and spine biomechanics (2-4). Thus, the assessment of foot posture is commonly addressed in not only foot and ankle conditions but in lower limb and spine conditions (5-7). Navicular drop (ND) and Foot Posture Index-6 (FPI-6) are among the most widely used foot posture measures in clinic and research due to their high reliability and practical applicability (8-10).

Plantar pressure parameters, that includes primarily contact area, peak pressure, and maximum force, are accepted as an important indicator of the function and biomechanics of the lower limb, and analysis of these parameters is frequently addressed in the clinical setting.

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of lower limb problems (11). Further, people with abnormal foot posture may exhibit altered plantar pressure distribution compared to the normal foot posture (12). In addition to the information already provided in the literature, clarifying the correlation of foot posture measures with static and dynamic plantar pressure variables may provide valuable data regarding how the improvement or changes in foot posture will affect plantar pressure distribution.

A few studies investigated the correlation between foot posture measures and plantar pressure variables in adults. Jonely et al. (13) investigated the relationship of static foot posture measures including ND, navicular drift, and arch index with static and dynamic peak pressure under the medial column of the foot. They found that there is a poor correlation between ND and dynamic peak pressure under the hallux, and the other significant correlations are negligible. However, they did not report any result regarding the contact area or maximum force. Teyhen et al. (14) investigated the association of FPI-6 with dynamic plantar pressure variables including all three primary parameters and found that there are significant correlations, but these correlations were negligible. No study has investigated the correlation of static foot measures with both static and dynamic plantar pressure parameters including all three primary parameters.

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In the light of this information, we aimed to determine the relationship of FPI-6 and ND with plantar pressure variables including contact area, maximum force, and peak pressure during static standing and preferred walking. We hypothesized that there would be a significant correlation between the foot posture measures and both static and dynamic plantar pressure variables.

Materials and Methods

This cross-sectional study was conducted following the ethical approval was obtained from Dokuz Eylul Institutional Non-invasive Research Ethics Board (No: 2020/06-24, Date: 09.03.2020). All procedures were conducted in accordance with the Declaration of Helsinki, and the signed informed consent was obtained from all participants before their participation.

Participants

Seventy people between the ages of 18-30 (43 females, 27 males) were included among university students and faculty members (Table 1). People were excluded from the study if they had a lack of anatomical integrity of the foot, a previous foot or ankle surgery, foot pain during rest, standing or short walk, or a history of foot or ankle injury for the past 12 months.

Procedures

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All assessments were applied to the dominant foot by same researcher (MK) having five years of postgraduate relevant experience. The dominant foot was determined by asking the participants which foot they would use when they were asked to kick a ball as hard as they could. ND and FPI-6 were used to assess foot posture. ND and FPI-6 were reported to be reliable to assess foot posture in the previous research conducted by MK, who applied all assessments in the present study (15). After performing foot posture measures, plantar pressure variables were obtained by a pressure-sensitive mat (HR Mat, Tekscan, Boston, USA) during standing and walking barefoot. For recording static plantar pressure variables, participants were asked to stand quietly on the pressure sensitive mat for 30 seconds. Dynamic plantar pressure variables were collected using the mid-gait collection method (16). The pressure-sensitive mat was placed in the middle of the 6-meter walkway but was not hidden in the walkway. Participants were asked to walk at their comfortable speed. To prevent targeting, all participants were instructed not to look down at the pressure-sensitive mat but to look at a fixed point far from the mat during walking. Participants were allowed to perform a practice session so that they were familiar with the mid-gait collection method. Steps taken outside the normal gait pattern were excluded, and three successful steps were recorded. All assessments were repeated three times and averaged.

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Navicular Drop

The digital vernier caliper measuring with an accuracy of ±0.02mm (Absolute Digimatic, Mitutoyo, Japan) was used to measure ND. ND is obtained by calculating the difference in the height of navicular tuberosity between subtalar neutral posture and relaxed foot posture. ND measurement was performed based on the methodology described by Shrader et al. (8).

Subtalar neutral position was determined according to the talar head congruence method while the participant was sitting (17). Then, the navicular tuberosity was palpated and marked, and the height of the navicular tuberosity was measured. Then, the participant was asked to stand in relaxed foot posture, and the measurement of the height of the navicular tuberosity was repeated. We palpated and marked once more the navicular tuberosity during standing in relaxed foot posture based on the study suggesting that skin movement led to a systematic error during navicular drop measurement (8). The navicular drop value was determined by subtracting the height measured when the foot is in the relaxed stance posture from the one measured when the subtalar joint is in the neutral posture. Higher values mean a more pronated foot posture and lower values a more supinated posture (8,9).

Foot Posture Index-6
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FPI-6, which is an observational tool, was performed while participants were standing in a relaxed, upright posture. FPI-6 comprises six items: palpation of the talar head, curvatures above and below the lateral malleolus, frontal plane position of the calcaneus, prominence in the talonavicular joint, congruence of the medial longitudinal arch, abduction/adduction of the forefoot on the rearfoot. Each item is scored from -2 to 2 using 5-point Likert scale. Higher scores indicate a more pronated foot posture and lower scores a more supinated posture (10).

Plantar Pressure Data Collection

The pressure-sensitive mat (HR Mat, Tekscan, Boston, USA) used to obtain plantar pressure variables has 4 force sensors per cm². FootMat™ Software for Researchers was used to analyze plantar pressure data. Data were collected at 60 Hz and were calibrated using participants’ body weight prior to data collection. Plantar pressure variables were collected for eight different foot regions: heel, midfoot, metatarsals 1-5 (M1-5) and hallux (Figure 1). For each foot segment, the following data were obtained: contact area (cm²), maximum force (%BW) and peak pressure (kPa) (18).

Sample Size Calculation and Statistical Analyses

The required sample size was calculated by G*Power (version 3.1.9.4, Düsseldorf University, Germany) according to tail(s)=two, power=95%, Cohen’s effect size=0.41 (13), and alpha error

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probability=0.05 and determined as 70. A Kolmogorov–Smirnov test was used to determine whether data was normally distributed or not. Pearson correlation coefficients were calculated to determine the relationship of ND values with static and dynamic plantar pressure variables since data had a normal distribution. Also, Spearman correlation coefficients were calculated to determine the relationship of FPI-6 scores with static and dynamic plantar pressure variables since the FPI-6 score of someone is not a continuous variable. Descriptive statistics were presented with mean and standard deviation. Pearson correlation coefficients below 0.300 were accepted as negligible and higher ones were interpreted. A correlation coefficient less than 0.3 indicates a negligible correlation, coefficients between 0.3 and 0.5 indicate poor correlation, coefficients between 0.5 and 0.7 indicate moderate correlation, coefficients between 0.7 and 0.9 indicate high correlation, coefficients between 0.9 and 1 indicate very high correlation (19-21).

Results

Demographic characteristics and foot posture measures were presented in Table 1, also static and dynamic plantar pressure variables were presented in Table 2.

Relationship of ND With Plantar Pressure Variables

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ND was moderately correlated with dynamic contact area under the midfoot and M2 (r=0.638 for midfoot, r=0.545 for M2, p<0.01 for all, Figure 2) also poorly correlated with dynamic contact area under the M3 and M4 (r=0.486 for M3, r=0.361 for M4, p<0.01 for all). A poor correlation was found between ND and dynamic maximum force under the midfoot and M1 (r=0.454 for midfoot, r=-0.334 for M1, p<0.01). ND showed a poor correlation with static contact area, maximum force, and peak pressure under the M1 and hallux (For contact area: r=0.463 for M1, r= 0.318 for hallux; for maximum force: r=0.441 for M1, r=0.385 for hallux; for peak pressure: r=0.437 for M1, r=0.421 for hallux, p<0.01 for all). ND was also poorly correlated with static contact area under the M2 (r=0.314, p<0.01). Further, ND was poorly correlated with static peak pressure under the M2 and M5 (r=0.312 for M2, r=-0.306 for M5, p<0.01) (Table 3 and 4).

**Relationship of FPI-6 with Plantar Pressure Variables**

A moderate correlation was found between FPI-6 and dynamic contact area under the midfoot (rho=0.527, p<0.01) (Figure 2). FPI-6 showed a poor correlation with dynamic contact area under the M2 and M3 (rho=0.400 for M2, rho=0.308 for M3, p<0.01) and dynamic peak pressure under the hallux (rho=0.407, p<0.01). Also, FPI-6 was poorly correlated with dynamic maximum force under the midfoot and hallux (rho=0.305 for midfoot, rho=0.312 for hallux,

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p<0.05). Further, FPI-6 was poorly correlated with static contact area, maximum force, and peak pressure under the M1 and hallux (For contact area: ρ=0.323 for M1, ρ= 0.354 for hallux; for maximum force: ρ=0.403 for M1, ρ=0.393 for hallux; for peak pressure: ρ=0.428 for M1, ρ=0.470 for hallux, p<0.01) (Table 3 and 4).

Discussion

The current study investigated the correlation of the two most common measures of foot posture with static and dynamic plantar pressure parameters to provide data regarding how changes in foot posture may affect plantar pressure distribution. The measures were poorly correlated with contact area, maximum force, and peak pressure under the medial forefoot (M1 and hallux) during static standing. There were poor to moderate correlations between the measures and contact area under the midfoot and central forefoot (M2, M3) during walking. Further, they were poorly correlated with dynamic maximum force under the midfoot. A negative and poor correlation was found between ND and maximum force under the M1, moreover, FPI-6 was poorly correlated with dynamic maximum force and peak pressure under the hallux.

Jonely et al. (13) reported that ND was poorly correlated with dynamic peak pressure under the hallux, and other correlations of ND with static and dynamic peak pressures under
the medial column of the foot were negligible. The result of the aforementioned study is largely in line with our result; thus, it may be said that the changes in ND value may not be indicative of the changes in dynamic peak pressure. Teyhen et al. (14) found that there were correlations at the 0.001 significance level between FPI-6 and dynamic plantar pressure variables, but these correlations were negligible. The previous result is also largely consistent with our result indicating that FPI-6 is moderately correlated with dynamic contact area under the midfoot, but poorly or negligibly correlated with all other dynamic plantar pressure variables.

Prolonged standing has been suggested to contribute to degenerative damage to the joints of the feet and cause pain (22-24). Further, a study indicated that pain in the feet is commonly reported during standing position compared to sedentary or walking tasks (25). Therefore, the determination of the practical foot posture measures that correlate with the force and pressure affecting the foot during the static standing may be valuable for clinicians and researchers. The current study has suggested that ND and FPI-6 are related to static maximum force and peak pressure under the medial forefoot. Therefore, ND and FPI-6 may be useful in the clinical assessment of medial forefoot complaints related to prolonged standing.

Our results have suggested that there is poor to moderate positive correlations between static foot posture measures, and dynamic contact area under the midfoot and central forefoot

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and dynamic maximum force under the midfoot. The result is consistent with a review of recent literature suggesting that people with a pronated foot display higher contact area under the central forefoot and midfoot and higher maximum force under the midfoot (12). Further, our results have also shown that there is a negative and poor correlation between ND and maximum force under the M1 also a positive and poor correlation between FPI-6 and, dynamic maximum force and peak pressure under the hallux. The result is consistent with the review of recent literature, which also suggests that people with a pronated foot display lower maximum force under the M1 and higher maximum force and peak pressure under the hallux (12).

Besides, it was reported that planus foot posture and pronated foot function were associated with foot pain, and specifically, planus foot posture is associated with arch pain in men (26). Considering planus foot posture can be also considered as excessive pronation (2) and our result indicating that the measures are related to maximum force under the midfoot, it can be said that FPI-6 and NDP may be useful in the clinical assessment of midfoot complaints related to high force during walking. Further, it was indicated that peak pressure and force-time integral under the hallux and planus foot posture were associated with hallux valgus (27,28).

Our results also have shown that FPI-6 was related to peak pressure and maximum force under the hallux, therefore, FPI-6 may provide valuable data regarding hallux problems related to high loads such as hallux valgus. On the other hand, although altered foot posture has been
reported to be a risk factor for many foot disorders such as plantar fasciitis, stress fracture, foot pain, and foot overuse injuries (26,29-32), it is not known the correlation between any foot posture measures and foot pain or pathology. Future research investigating the correlation of foot posture measures with foot complaints and disorders may provide valuable data for clinical use and research.

Limitations

There are some limitations of the current study. First, this study did not involve individuals with an ongoing foot-ankle injury; therefore, the results cannot be generalized to individuals with foot pathology. The second limitation is that we did not classify the foot postures of participants, and the results may be different in correlation studies involving individuals with certain foot postures. Thirdly, ND was first described by Brody as a distance the navicular tuberosity moves from subtalar neutral posture to relaxed foot posture. Although the person being measured is standing in both foot postures in Brody’s technique, we assessed the subtalar neutral posture while the participant was sitting, as in many other studies.

Conclusion

The regions where foot posture measures correlate with plantar pressure variables are different during standing and walking, and these correlations are poor to moderate. Both

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measures were poorly correlated with all three plantar pressure parameters under the medial forefoot during static standing, thus they may be useful in the clinical assessment of medial forefoot problems related to prolonged static standing. The measures were also poorly related to dynamic maximum force under the midfoot, which means that they may provide valuable data on the midfoot complaints related to high force during walking. Further, FPI-6 was poorly correlated with dynamic maximum force and peak pressure under the hallux, so it can be addressed in the clinical management of hallux complaints related to the high loads during walking. On the other hand, the fact that there is only a poor correlation between measures and dynamic or static force and pressure values should be considered when the measures are used in the clinic.

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Conflict of Interest: None reported.

References


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Table 1. Demographic characteristics and foot posture measures of participants

<table>
<thead>
<tr>
<th></th>
<th>Participants (n=70)</th>
<th>Females (n=43)</th>
<th>Males (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>24.6 (2.73)</td>
<td>24.72 (2.54)</td>
<td>24.42 (3.04)</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>64.6 (11.8)</td>
<td>58.71 (7)</td>
<td>73.98 (11.91)</td>
</tr>
<tr>
<td>Height, cm</td>
<td>168.67 (8.39)</td>
<td>164.37 (6.43)</td>
<td>175.51 (6.4)</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>22.61 (3.02)</td>
<td>21.76 (2.61)</td>
<td>23.96 (3.18)</td>
</tr>
<tr>
<td>ND, mm</td>
<td>11.97 (5.3)</td>
<td>11.48 (4.76)</td>
<td>12.75 (6.08)</td>
</tr>
<tr>
<td>FPI-6</td>
<td>5.82 (2.37)</td>
<td>5.6 (2.04)</td>
<td>6.16 (2.82)</td>
</tr>
<tr>
<td>Gender, % male</td>
<td>38.57</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

SD: Standard deviation, BMI: Body mass index, ND: Navicular drop, FPI-6: Foot Posture Index-6
Table 2. Static and dynamic plantar pressure variables of all participants (n=70), mean (SD)

<table>
<thead>
<tr>
<th></th>
<th>Heel</th>
<th>Midfoot</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>Hallux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact area, cm²</td>
<td>24.66 (3.24)</td>
<td>12.73 (8.42)</td>
<td>8.77 (2.36)</td>
<td>6.92 (1.3)</td>
<td>7.8 (1.5)</td>
<td>7.31 (1.66)</td>
<td>4.18 (1.77)</td>
<td>1.94 (1.1)</td>
</tr>
<tr>
<td>Maximum force, %BW</td>
<td>32 (9.35)</td>
<td>6.15 (4.81)</td>
<td>6.36 (3.46)</td>
<td>5.75 (2.11)</td>
<td>6.53 (2.27)</td>
<td>4.95 (1.9)</td>
<td>2.33 (1.64)</td>
<td>1.45 (0.83)</td>
</tr>
<tr>
<td>Peak pressure, kPa</td>
<td>141.44 (44.31)</td>
<td>44.36 (16.59)</td>
<td>73.11 (41.01)</td>
<td>77.14 (26.67)</td>
<td>79.57 (28.15)</td>
<td>62.49 (23.82)</td>
<td>48.23 (26.37)</td>
<td>50.71 (38.82)</td>
</tr>
<tr>
<td><strong>Dynamic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact area, cm²</td>
<td>24.76 (2.83)</td>
<td>20.5 (7.68)</td>
<td>10.56 (1.67)</td>
<td>8.13 (1.39)</td>
<td>9.82 (1.58)</td>
<td>9.02 (1.46)</td>
<td>5.94 (1.91)</td>
<td>6.87 (1.12)</td>
</tr>
<tr>
<td>Maximum force, %BW</td>
<td>87.48 (13.65)</td>
<td>17.1 (8.76)</td>
<td>24.3 (8)</td>
<td>25.74 (5.69)</td>
<td>29.93 (5.24)</td>
<td>19.65 (5.43)</td>
<td>9.24 (5.35)</td>
<td>22.89 (9.04)</td>
</tr>
<tr>
<td>Peak pressure, kPa</td>
<td>422.83 (126.09)</td>
<td>116.15 (48.76)</td>
<td>286.04 (136.11)</td>
<td>400.8 (122.4)</td>
<td>406.42 (117.33)</td>
<td>282.76 (93.87)</td>
<td>203.59 (142.79)</td>
<td>442.62 (185.3)</td>
</tr>
</tbody>
</table>

SD: Standard deviation, M: Metatarsal

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Table 3. Correlation coefficients between static plantar pressure values and foot posture measures, all participants (n=70)

<table>
<thead>
<tr>
<th></th>
<th>Heel</th>
<th>Midfoot</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>Hallux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static contact area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>0.201</td>
<td>0.270</td>
<td>0.463*</td>
<td>0.314*</td>
<td>0.129</td>
<td>0.095</td>
<td>0.144</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.095</td>
<td>0.024</td>
<td>&lt;0.001</td>
<td>0.008</td>
<td>0.288</td>
<td>0.436</td>
<td>0.234</td>
</tr>
<tr>
<td>FPI-6</td>
<td>rho</td>
<td>0.119</td>
<td>0.114</td>
<td>0.323*</td>
<td>0.148</td>
<td>0.039</td>
<td>-0.029</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.326</td>
<td>0.346</td>
<td>0.006</td>
<td>0.223</td>
<td>0.748</td>
<td>0.810</td>
<td>0.755</td>
</tr>
<tr>
<td><strong>Static maximum force</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>0.056</td>
<td>0.176</td>
<td>0.441*</td>
<td>0.228</td>
<td>0.054</td>
<td>-0.168</td>
<td>-0.223</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.646</td>
<td>0.145</td>
<td>&lt;0.001</td>
<td>0.057</td>
<td>0.654</td>
<td>0.165</td>
<td>0.064</td>
</tr>
<tr>
<td>FPI-6</td>
<td>rho</td>
<td>0.005</td>
<td>0.043</td>
<td>0.403*</td>
<td>0.231</td>
<td>0.070</td>
<td>-0.126</td>
<td>-0.100</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.970</td>
<td>0.724</td>
<td>&lt;0.001</td>
<td>0.054</td>
<td>0.564</td>
<td>0.298</td>
<td>0.409</td>
</tr>
<tr>
<td><strong>Static peak pressure</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>0.283</td>
<td>0.035</td>
<td>0.437*</td>
<td>0.312*</td>
<td>0.205</td>
<td>-0.045</td>
<td>-0.306*</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.018</td>
<td>0.776</td>
<td>&lt;0.001</td>
<td>0.009</td>
<td>0.089</td>
<td>0.711</td>
<td>0.010</td>
</tr>
<tr>
<td>FPI-6</td>
<td>rho</td>
<td>0.248</td>
<td>-0.030</td>
<td>0.428*</td>
<td>0.266</td>
<td>0.212</td>
<td>-0.020</td>
<td>-0.197</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.038</td>
<td>0.803</td>
<td>&lt;0.001</td>
<td>0.026</td>
<td>0.078</td>
<td>0.870</td>
<td>0.102</td>
</tr>
</tbody>
</table>

*: r or rho>0.300, M: Metatars, ND: Navicular drop, FPI-6: Foot Posture Index-6

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Table 4. Correlation coefficients between dynamic plantar pressure values and foot posture measures, all participants (n=70)

<table>
<thead>
<tr>
<th></th>
<th>Heel</th>
<th>Midfoot</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>Hallux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dynamic contact area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>0.214</td>
<td>0.638*</td>
<td>0.212</td>
<td>0.545*</td>
<td>0.486*</td>
<td>0.361*</td>
<td>0.074</td>
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<tr>
<td></td>
<td>p</td>
<td>0.076</td>
<td>&lt;0.001</td>
<td>0.078</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.002</td>
<td>0.543</td>
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<tr>
<td>FPI-6</td>
<td>rho</td>
<td>0.150</td>
<td>0.527*</td>
<td>0.190</td>
<td>0.400*</td>
<td>0.308*</td>
<td>0.192</td>
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<tr>
<td></td>
<td>p</td>
<td>0.216</td>
<td>&lt;0.001</td>
<td>0.115</td>
<td>&lt;0.001</td>
<td>0.009</td>
<td>0.111</td>
<td>0.851</td>
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<tr>
<td><strong>Dynamic maximum force</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>-0.169</td>
<td>0.454*</td>
<td>-0.334*</td>
<td>0.088</td>
<td>0.198</td>
<td>0.047</td>
<td>-0.170</td>
</tr>
<tr>
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<td>0.005</td>
<td>0.469</td>
<td>0.101</td>
<td>0.698</td>
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<tr>
<td>FPI-6</td>
<td>rho</td>
<td>-0.110</td>
<td>0.305*</td>
<td>-0.213</td>
<td>-0.057</td>
<td>0.059</td>
<td>-0.026</td>
<td>-0.123</td>
</tr>
<tr>
<td></td>
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<td>0.365</td>
<td>0.010</td>
<td>0.077</td>
<td>0.641</td>
<td>0.627</td>
<td>0.829</td>
<td>0.312</td>
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<tr>
<td><strong>Dynamic peak pressure</strong></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>ND</td>
<td>r</td>
<td>0.1/5</td>
<td>0.196</td>
<td>-0.159</td>
<td>0.221</td>
<td>0.146</td>
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<tr>
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<td>0.104</td>
<td>0.196</td>
<td>0.066</td>
<td>0.228</td>
<td>0.875</td>
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<tr>
<td>FPI-6</td>
<td>rho</td>
<td>0.133</td>
<td>0.079</td>
<td>-0.033</td>
<td>0.090</td>
<td>-0.034</td>
<td>-0.122</td>
<td>-0.005</td>
</tr>
<tr>
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<td>p</td>
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<td>0.513</td>
<td>0.789</td>
<td>0.460</td>
<td>0.779</td>
<td>0.314</td>
<td>0.968</td>
</tr>
</tbody>
</table>

* r or rho>0.300, Mt: Metatarsal, ND: Navicular drop, FPI-6: Foot Posture Index-6

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Figure 1. The eight foot segments used to analyze plantar pressure scans

Hallux

M1 M2 M3 M4 M5

M: Metatarsal

Midfoot

Heel

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Figure 2. Moderate correlations between foot posture measures and plantar pressure variables

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