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Research Article

INFLUENCE OF FOOT TYPE ON BALANCE AND POSTURAL SWAY AMONG THE COMMUNITY DWELLING OLDER ADULTS

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ABSTRACT

Objective: The objectives of this study are as follows: (1) To find the correlation between foot type on static and dynamic balance among community dwelling older adults, and (2) to find the correlation between postural sway and foot type among community dwelling older adults.

Method: A total of 20 community-dwelling older adults were included for the study based on inclusion and exclusion criteria. The subjects' foot type was assessed using the navicular drop test. The subjects were classified into three different foot types: Pronated, neutral, and supinated. After classifying the subjects according to the foot type, they were measured for static and dynamic balance using Berg Balance Scale (BBS). For the same subjects, postural sway was assessed with Lord's-Sway meter under four situations: (1) Standing on stable surface (floor) open eyes, (2) standing on stable surface (floor) closed eyes, (3) standing on unstable surface (foam) with eyes open, and (4) standing on unstable surface (foam) with eyes closed. The sway of older adult was recorded and analyzed.

Result: There was a strong correlation between pronated and anteroposterior sway in eye open (EO) on unstable surface and between neutral and anteroposterior sway in eye close standing on stable surface. There was a moderate correlation between BBS score and neutral foot type. Pronated and anteroposterior sway in EO standing on stable surface also showed moderate correlation.

Conclusion: The results showed strong-to-moderate correlation between foot type, postural sway, and balance; from this study, it is clear that foot position affects the balance among older adults.

Keywords: Foot type (supination, neutral and pronation) balance, Postural sway, Older adults.

INTRODUCTION

Foot is the most important anatomical part of the body to balance the weight and transmit weight of the body to the ground. Foot helps in shock absorption and transition to different phases of gait. Foot plays a major role in balancing the posture while standing, sitting, and walking and prevents from falling. Therefore, foot must be stable enough to provide adequate base of support [1,2]. Hence, proper anatomical foot position is important to balance posture. The foot can assume any position as it has characteristics of triple axial joint. Foot stability is maintained by osseous and soft tissue support [1,3]. Abnormalities in structure can lead to movement alternation between the joints and may contribute to excessive stress to foot complex.

Pronation and supination are essential movements of foot. Pronation is coupled with eversion, dorsiflexion, and abduction, whereas supination is coupled motion of inversion, plantar flexion, and adduction. Excessive pronation or supination reduces the ability of foot to act as shock absorber, torque converter, and mobile adaptor to the terrain [3-5]. As changes in the joint occur, there are also changes in connective tissue resulting in alternation of muscle function.

During excessive pronation, the calcaneus is subluxed under the talus. The navicular and cuboid move away from each other, and the height is also reduced. The inclination angle of the calcaneus is reduced. The pronated foot is characterized by flattening of the medial arch and hyper-mobility of the joint.

Excessive supination may not adapt to the underlying surface; therefore, there is an increase in demand form the surrounding musculoskeletal structure to maintain postural balance. In excessive pronation demands are greater from neuromuscular system to stabilize the foot and to maintain upright stance.

In standing surface, plantar contact area is reduced. This reduction in contact area for supinated foot may also reduce sensory input from the plantar sensory end organ [4]. Sensory end organ is important for controlling balance. The supinated foot is characterized by high arch and hypo-mobility of the joint. A study has proven that pronated foot has poorer stability compared to the supinated foot during static postural control testing among adults. Foot position can be analyzed by navicular drop test [6]. Any alteration in foot position can alter balance.

Balance is defined as the process of maintaining center of gravity (COG) within the body's base support to maintain upright stand and to walk. The peripheral (PNS) and the central (CNS) components of the nervous system continuously interact with each other to control the body alignment and COG over the base. Balance is achieved and maintained by a complex set of sensorimotor control systems that include sensory input from vision, proprioception, and the vestibular system; integration of that sensory input; and motor output to the eye and body muscle. Position of foot, on the other hand, is the predictor of balance. Balance can be measured by Berg Balance Scale (BBS). BBS is the best single predictor of falls in community-dwelling older adults without neurologic disability [7-9].

Humans are swayed in several directions for the maintenance of standing balance within the base of support. The movement of the center of mass (COM) in a standing position is postural sway. The postural sway velocity is highest in the pronated foot and lowest postural sway in supinated foot among young adults. Visual, vestibular, somatosensory, and musculoskeletal system these all control the postural stability and steadiness during upright standing [10]. Musculoskeletal muscles which help in postural control are calf muscles (gastrocnemius and soleus). An impairment in any of these systems can result in a deficit in postural control. Some studies show that the postural sway result from perturbation such as breathing or the heartbeat. COM sway is related to fluctuation in muscle length and ankle torque. The local proprioception is required to the ankle muscle during the standing postural sway is measured by various methods, i.e., Lord Sway meter, and force plates [11].

Always, rehabilitation of geriatrics focuses on strengthening, proprioceptive, and balance training but none as focused on the correlation between the alignment of foot and balance and postural sway.

There are studies existing to prove foot alignment on balance among athletic subjects [12] and adults, and there are only few studies that have found the correlation between foot, balance, and postural sway. Hence, the aim of this study is to compare the foot type, postural sway, and balance among the community dwelling older adults.

PROCEDURE

It was an observational study. The study was conducted at Saveetha Medical College and Hospital, Saveetha university, Thandalam, Chennai – 602 105. Convenient sampling was used. The materials required for study were a ruler, chart, marker, two standard chairs (one with arm rest and; one without), footstool, Lord's Sway meter, and stopwatch.

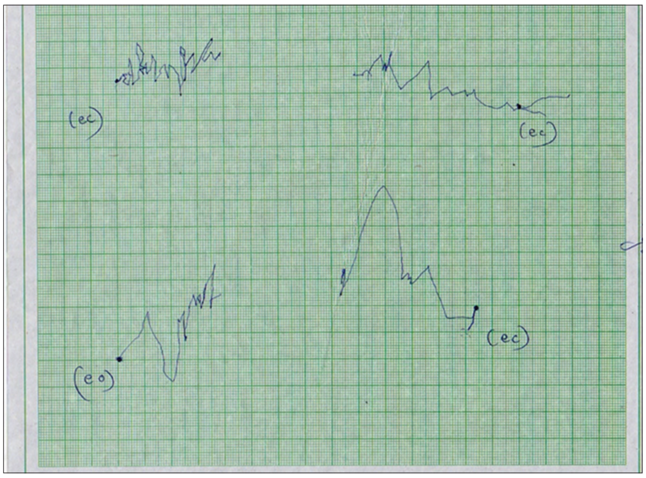


Fig. 1: Postural sway graph

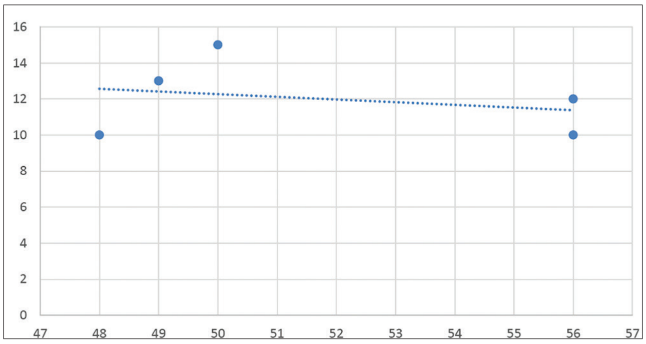
Fig. 2: Navicular drop test

The study was approved by the Ethical Committee for student in Saveetha University(002/06/2017/IES/SU). The procedure was explained in subject's own language and the written consent was obtained. 35 community-dwelling older adults were recruited for the study. There were initially assessed using 30 s sit to stand test and Romberg's test to assess lower limb muscle strength and sensory component. Of these samples, only 20 were selected and other 15 members were excluded from the study. Subjects with a history of cardiovascular disease like coronary artery diseases, any recent cardiac surgeries, congenital heart disease, and neurological disorders such as parkinsonism, stroke, and Guillain Barre syndrome were excluded. The subjects undergone any lower extremity surgery were also excluded.

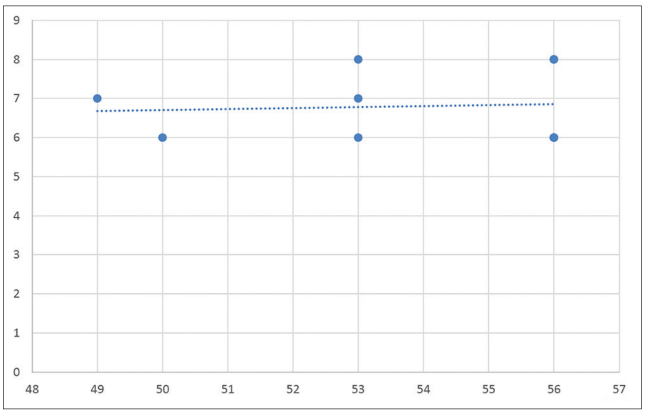
After the initial examination, the subjects' foot type was assessed using the navicular drop test. Subject was asked to stand on non-weight- bearing position, and the mark was placed over the navicular tuberosity. Next, the foot is placed on the floor, again in a non-weight-bearing position, and a mark was made on a card to measure the distance between the floor and navicular tubercle. The measure was repeated when the patient bears weight on the foot and the distance between the two marks is recorded. Inferior displacement of >10 mm while bearing weight is considered hyper pronation of the foot.

After classifying the subjects according to the foot type, they were measured for static and dynamic balance using BBS. BBS comprises 14 functions related to the static and dynamic balance, ranging from standing up from sitting position, turning 360̊, standing on one leg. The test took 15–20 min for each subject. Each function is scored from zero (unable to do) to four (independent). The sum of all the score is the final measure.

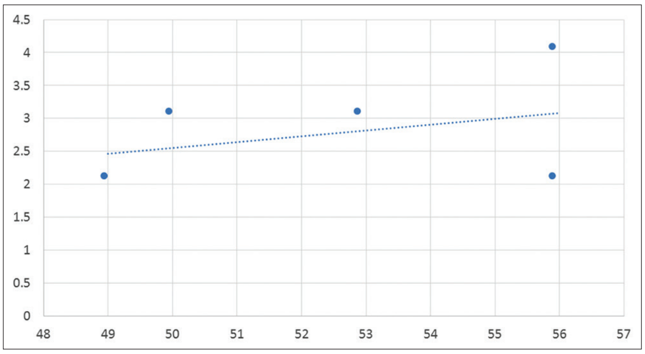
For the same subjects, postural sway was assessed using Lord's Sway meter under four situations: (1) standing on stable surface (floor) open



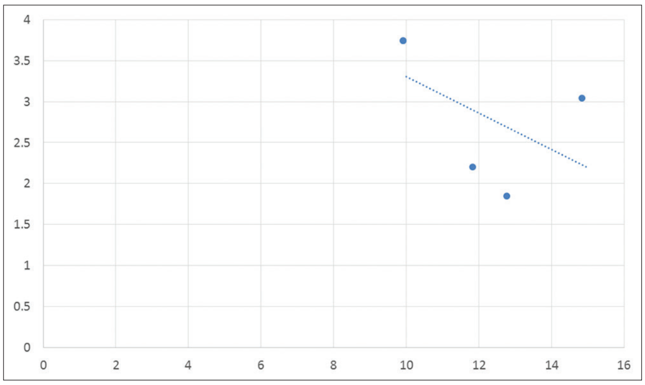
Graph 1: Correlation between pronated foot type and Berg Balance Scale



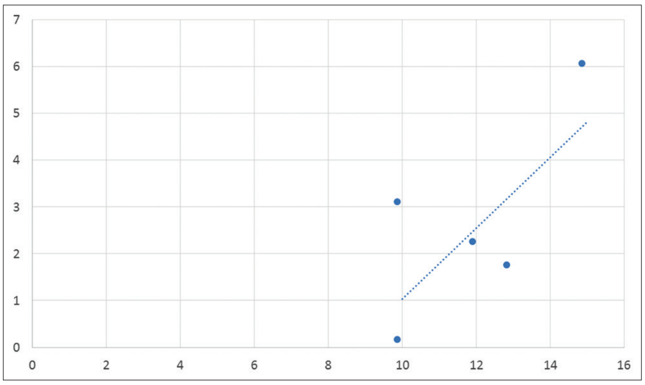
Graph 2: Correlation between neutral foot type and Berg Balance Scale



Graph 3: Correlation between supinated foot type and Berg Balance Scale



Graph 4: Correlation between pronated foot and anteroposterior sway- eye open (stable surface)



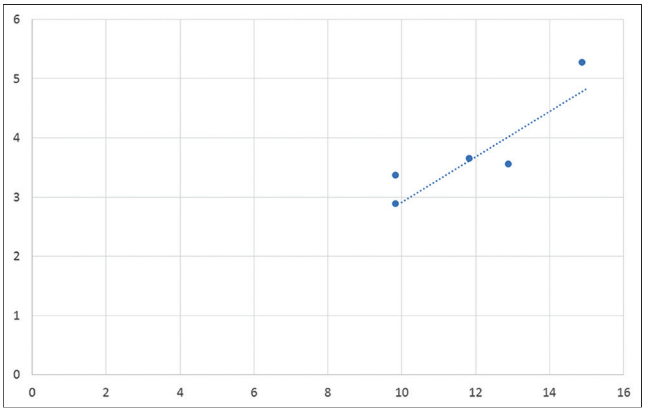
Graph 5: Correlation between pronated foot and anteroposterior sway- eye close (stable surface)

eyes, (2) standing on stable surface (floor) closed eyes, (3) standing on unstable surface (foam) with eyes open, and (4) standing on unstable surface(foam) with eyes closed. The sway of older adult was recorded and analyzed.

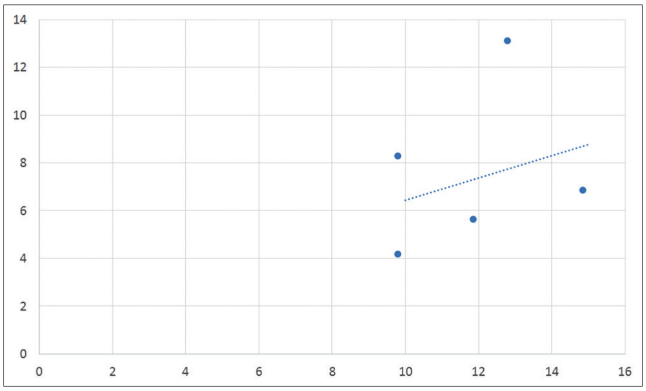
The values obtained were tabulated, and the correlation between foot type and balance, foot type and postural sway was analyzed.

RESULT

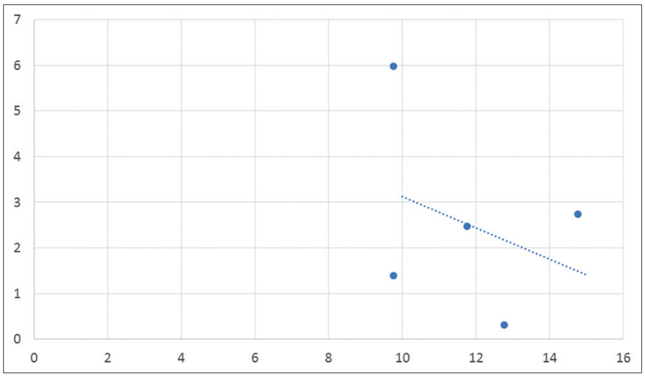
Table 1 shows a correlation between BBS score and pronated foot type with mean, standard deviation (SD), and correlation value. It showed negligible correlation.



Graph 6: Correlation between pronated foot and anteroposterior sway- eye open (unstable surface)



Graph 7: Correlation between pronated foot and anteroposterior sway- eye close (unstable surface)



Graph 8: Correlation between pronated foot and lateral sway-eye open (stable surface)

Table 2 shows a correlation between BBS score and neutral foot type with mean, SD, and correlation value. It showed moderate correlation.

Table 3 shows a correlation between BBS score and supinated foot type with mean, SD, and correlation value. It showed weak correlation.

Table 4 shows a correlation between pronated foot type and anteroposterior sway with eyes open stable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 5 shows a correlation between pronated foot type and anteroposterior sway with eyes closed stable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 1: Correlation between Berg Balance Score and pronated foot type

S. No	Number of subjects with pronated foot type	BBS (Mean±SD)	Pronated foot (Mean±SD)	Correlation value
1	5	51.8±3.89872	12±2.12132	−0.2

BBS: Berg balance scale, SD: Standard deviation

Table 2: Correlation between Berg Balance Score and neutral foot type

S.No	Number of subjects with neutral foot type	BBS (Mean±SD)	Neutral foot (Mean±SD)	Correlation value
1	10	53.8±2.65832	6.8±0.91894	0.7

BBS: Berg balance scale, SD: Standard deviation

Table 3: Correlation between Berg Balance Score and supinated foot type

S.No	Number of subjects with supinated foot type	BBS (Mean±SD)	Supinated foot (Mean±SD)	Correlation value
1	5	52.8±3.27109	12±0.83666	0.3

BBS: Berg balance scale, SD: Standard deviation

Table 4: Correlation between pronated foot and anteroposterior sway-EO (stable surface)

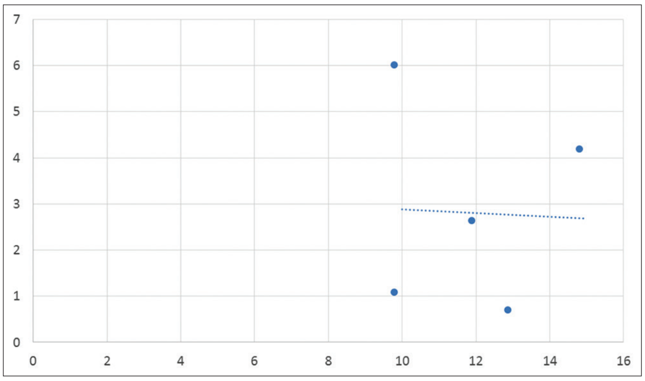
S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Anteroposterior sway (Mean±SD)	Correlation value
1	5	12±2.12132	2.86±0.88487	−0.5

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

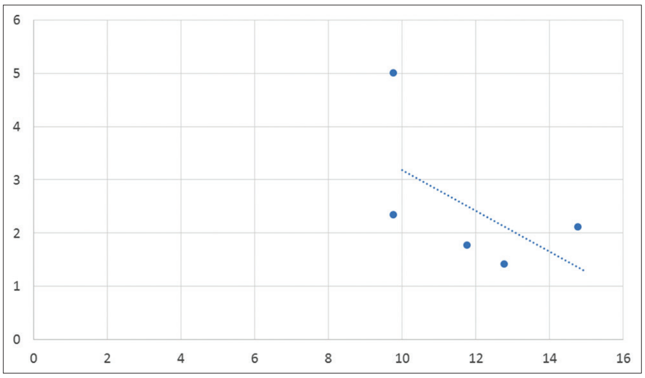
Table 5: Correlation between pronated foot and anteroposterior sway-EC (stable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Anteroposterior Sway EC (Mean±SD)	Correlation value
1	5	12±2.12132	2.54±2.21991	0.7

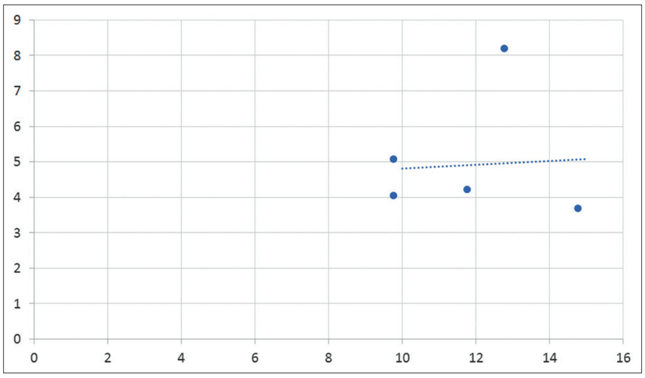
BBS: Berg balance scale, SD: Standard deviation, EC: Eye close



Graph 9: Correlation between pronated foot and lateral sway- eye close (stable surface)



Graph 10: Correlation between pronated foot and lateral sway- eye open (unstable surface)



Graph 11: Correlation between pronated foot and lateral sway- eye close (unstable surface)

Table 6 shows a correlation between pronated foot type and anteroposterior sway with eyes open unstable surface with mean, SD, and correlation value. It showed strong correlation.

Table 7 shows a correlation between pronated foot type and anteroposterior sway with eyes closed unstable surface with mean, SD, and correlation value. It showed negligible correlation.

Table 8 shows a correlation between pronated foot type and lateral sway with eyes open stable surface with mean, SD, and correlation value. It showed weak correlation.

Table 9 shows a correlation between pronated foot type and lateral sway with eyes closed stable surface with mean, SD, and correlation value. It showed weak correlation.

Table 6: Correlation between pronated foot and anteroposterior sway-EO (unstable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	5	12±2.12132	3.68±0.90388	0.8

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 7: Correlation between pronated foot and anteroposterior sway-EC (unstable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	5	12±2.12132	7.36±3.45659	0.2

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 8: Correlation between pronated foot and lateral sway-EO (stable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Lateral sway EO (Mean±SD)	Correlation value
1	5	12±2.12132	2.44±2.15476	−0.3

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 9: Correlation between pronated foot and lateral sway-EC (stable surface)

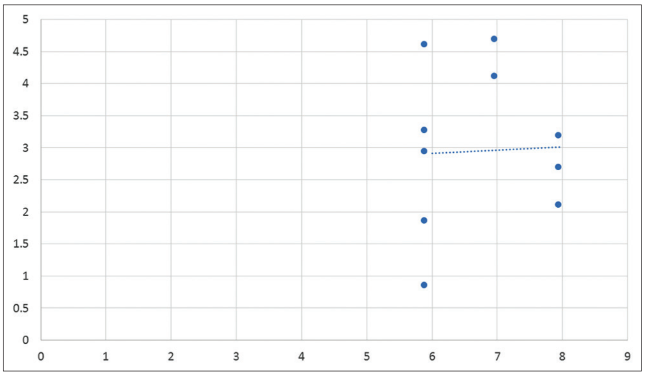
S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Lateral sway EC (Mean±SD)	Correlation value
1	5	12±2.12132	2.8±2.22711	−0.0

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

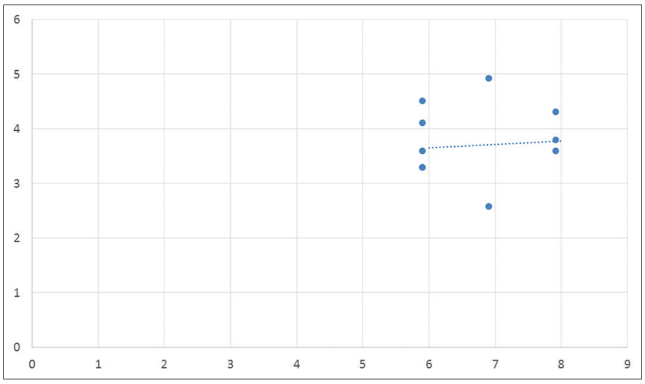
Table 10: Correlation between pronated foot and lateral sway-EO (unstable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Lateral sway EO (Mean±SD)	Correlation value
1	5	12±2.12132	2.42±1.42724	−0.5

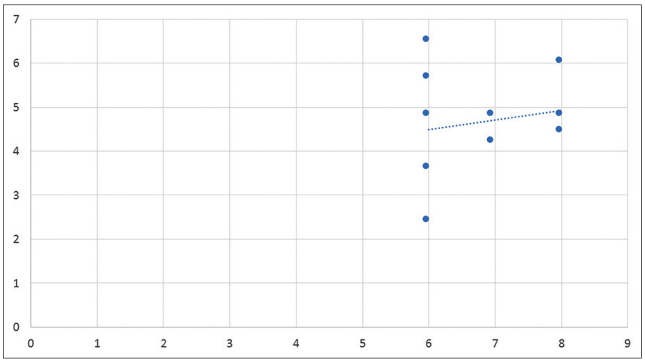
BBS: Berg balance scale, SD: Standard deviation, EO: Eye open



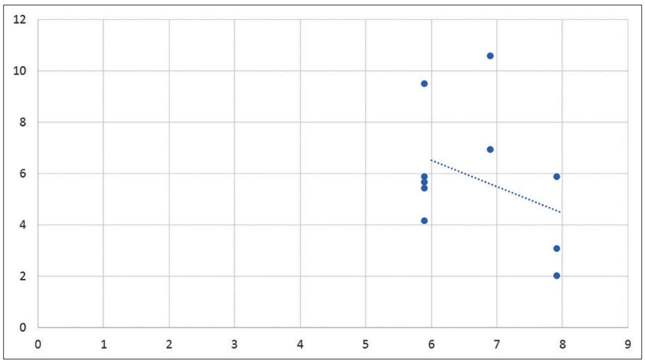
Graph 12: Correlation between neutral foot and anteroposterior sway-eye open (stable surface)



Graph 14: Correlation between neutral foot and anteroposterior sway-eye open (unstable surface)



Graph 13: Correlation between neutral foot and anteroposterior sway- eye close (stable surface)



Graph 15: Correlation between neutral foot and anteroposterior sway- eye close (unstable surface)

Table 10 shows a correlation between pronated foot type and lateral sway with eyes open unstable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 11 shows a correlation between pronated foot type and lateral sway with eyes closed unstable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 12 shows a correlation between neutral foot type and antero-posterior sway with eyes open stable surface with mean, SD, and correlation value. It showed weak correlation.

Table 13 shows a correlation between neutral foot type and antero-posterior sway with eyes closed stable surface with mean, SD, and correlation value. It showed strong correlation.

Table 14 shows a correlation between neutral foot type and antero-posterior sway with eyes open unstable surface with mean, SD, and correlation value. It showed strong correlation.

Table 15 shows a correlation between neutral foot type and antero-posterior sway with eyes closed unstable surface with mean, SD, and correlation value. It showed weak correlation.

Table 16 shows a correlation between neutral foot type and lateral sway with eyes open stable surface with mean, SD, and co relation value. It showed negligible correlation.

Table 17 shows a correlation between neutral foot type and lateral sway with eyes closed stable surface with mean, SD, and correlation value. It showed negligible correlation.

Table 18 shows a correlation between neutral foot type and lateral sway with eyes open unstable surface with mean, SD, and correlation value. It showed negligible correlation.

Table 19 shows a correlation between neutral foot type and lateral sway with eyes closed unstable surface with mean, SD, and correlation value. It showed negligible correlation.

Table 20 shows a correlation between supinated foot type and antero-posterior sway with eyes open stable surface with mean, SD, and correlation value. It showed weak correlation.

Table 21 shows a correlation between supinated foot type and antero-posterior sway with eyes closed stable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 22 shows a correlation between supinated foot type and antero-posterior sway with eyes open unstable surface with mean, SD, and correlation value. It showed moderate correlation.

Table 23 shows correlation between supinated foot type and antero-posterior sway with eyes closed unstable surface with mean, SD, and correlation value. It showed weak correlation.

Table 24 shows a correlation between supinated foot type and lateral sway with eyes open stable surface with mean, SD, and co relation value. It showed moderate correlation.

Table 25 shows a correlation between supinated foot type and lateral sway with eyes closed stable surface with mean, SD, and correlation value. It showed weak correlation.

Table 26 shows a correlation between supinated foot type and lateral sway with eyes open unstable surface with mean, SD, and correlation value. It showed negligible correlation.

Table 27 shows a correlation between supinated foot type and lateral sway with eyes closed unstable surface with mean, SD, and correlation value. It showed weak correlation.

Table 11: Correlation between pronated foot and lateral sway-EC (unstable surface)

S.No	Number of subjects with pronated foot type	Pronated foot (Mean±SD)	Lateral sway EC (Mean±SD)	Correlation value
1	5	12±2.12132	4.92±1.79917	0.0

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 12: Correlation between neutral foot and anteroposterior sway-EO (stable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	10	6.8±0.91894	2.95±1.21495	0.0

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 13: Correlation between neutral foot and anteroposterior sway-EC (stable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	10	6.8±0.91894	4.67±1.18701	0.1

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 14: Correlation between neutral foot and anteroposterior sway-EO (unstable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	10	6.8±0.91894	3.7±0.67165	0.0

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 15: Correlation between neutral foot and anteroposterior sway-EC (unstable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	10	6.8±0.91894	5.7±2.65497	−0.3

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 16: Correlation between neutral foot and lateral sway‑EO (stable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	10	6.8±0.91894	3.63±0.93696	0.0

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 17: Correlation between neutral foot and lateral sway‑EC (stable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	10	6.8±0.91894	4.42±1.18491	0.2

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 18: Correlation between neutral foot and lateral sway‑EO (unstable surface)

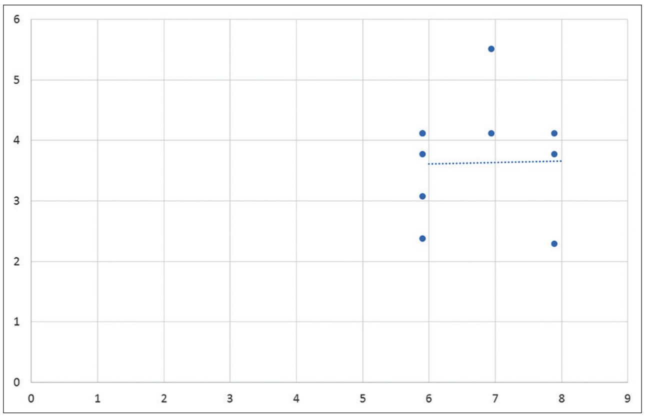
S.No	Number of subjects with Neutral foot type	Neutral foot (Mean±SD)	Anteroposterior Sway EO (Mean±SD)	Correlation value
1	10	6.8±0.91894	4.11±2.08351	0.1

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

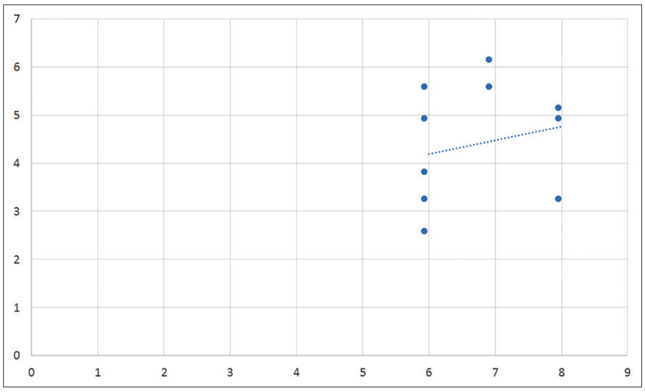
Table 19: Correlation between neutral foot and lateral sway‑EC (unstable surface)

S.No	Number of subjects with neutral foot type	Neutral foot (Mean±SD)	Lateral Sway EC (Mean±SD)	Correlation value
1	10	6.8±0.91894	5.53±1.10459	0.1

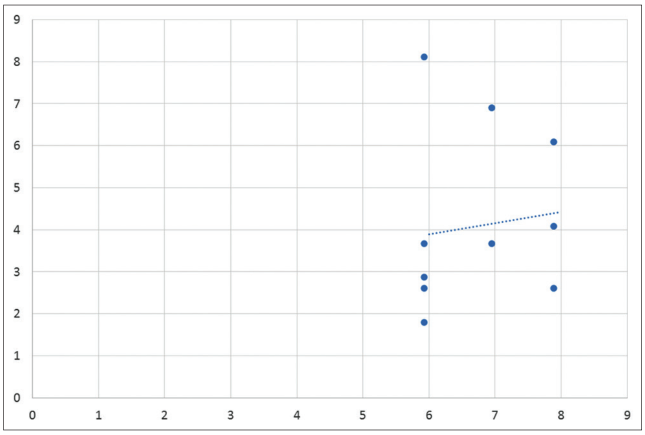
BBS: Berg Balance Scale, SD: Standard deviation, EC: Eye close



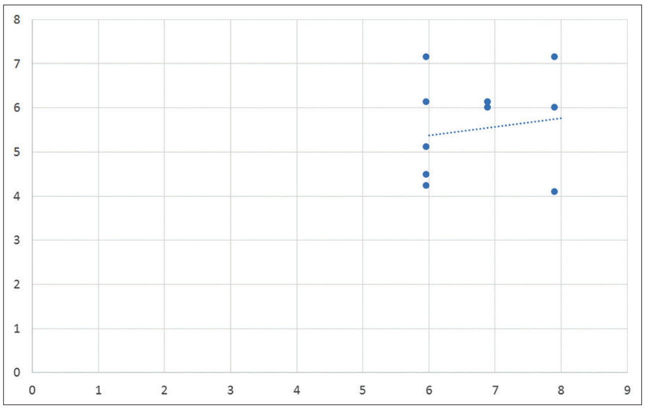
Graph 16: Correlation between neutral foot and lateral sway‑eye open (stable surface)



Graph 17: Correlation between neutral foot and lateral sway‑eye close (stable surface)



Graph 18: Correlation between neutral foot and lateral sway‑eye open (unstable surface)



Graph 19: Correlation between neutral foot and lateral sway‑eye close (unstable surface)

DISCUSSION

The aim of the study was to study the correlation between different foot types, i.e., neutral pronated and supinated foot with that of static and dynamic balance and postural sway among community‑dwelling older adults. As most often physio‑management aims on strengthening,

Table 20: Correlation between supinated foot and anteroposterior sway-EO (stable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	5	2.8±0.83666	3.38±0.9576	0.3

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 21: Correlation between supinated foot and anteroposterior sway-EC (stable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	5	2.8±0.83666	2.38±1.47547	0.6

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 22: Correlation between supinated foot and anteroposterior sway-EO (unstable surface)

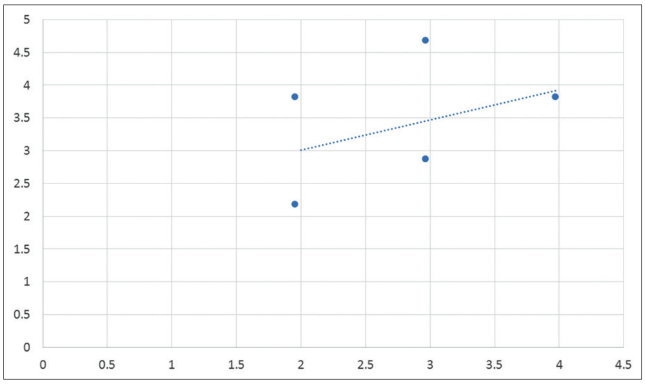
S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Anteroposterior sway EO (Mean±SD)	Correlation value
1	5	2.8±0.83666	3.34±0.350.71	−0.6

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

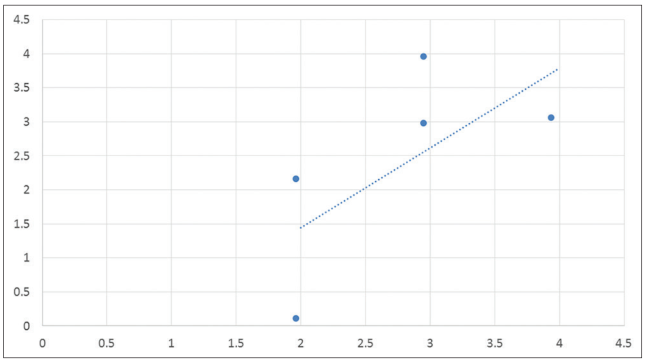
Table 23: Correlation between supinated foot and anteroposterior sway-EC (unstable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Anteroposterior sway EC (Mean±SD)	Correlation value
1	5	2.8±0.83666	4.68±3.01944	−0.4

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

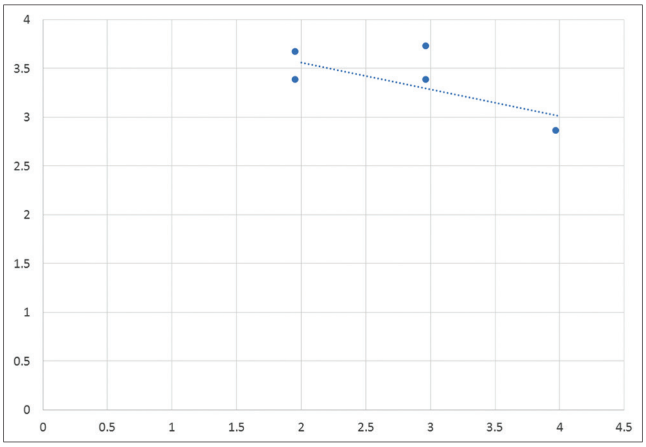


Graph 20: Correlation between supinated foot and anteroposterior sway-eye open (stable surface)

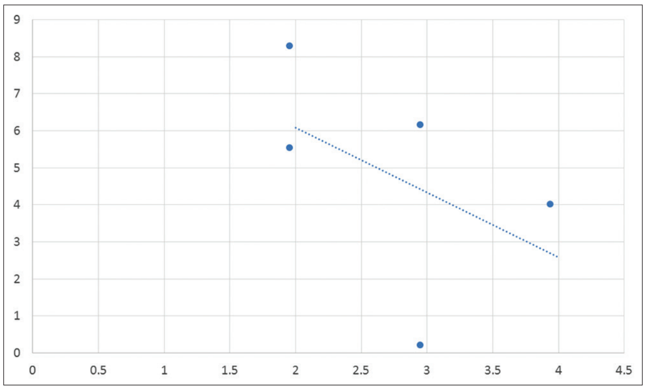


Graph 21: Correlation between supinated foot and anteroposterior sway-eye close (stable surface)

proprioceptive training balance training, and functional training, only few studies correlated the foot type with that of balance.



Graph 22: Correlation between supinated foot and anteroposterior sway-eye open (unstable surface)



Graph 23: Correlation between supinated foot and anteroposterior sway-eye close (unstable surface)

Table 24: Correlation between supinated foot and lateral sway-EO (stable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Lateral sway EO (Mean±SD)	Correlation value
1	5	2.8±0.83666	3.16±1.87697	−0.6

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

Table 25: Correlation between supinated foot and lateral sway-EC (stable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Lateral sway EC (Mean±SD)	Correlation value
1	5	2.8±0.83666	4.06±2.26117	−0.4

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

Table 26: Correlation between supinated foot and lateral sway-EO (unstable surface)

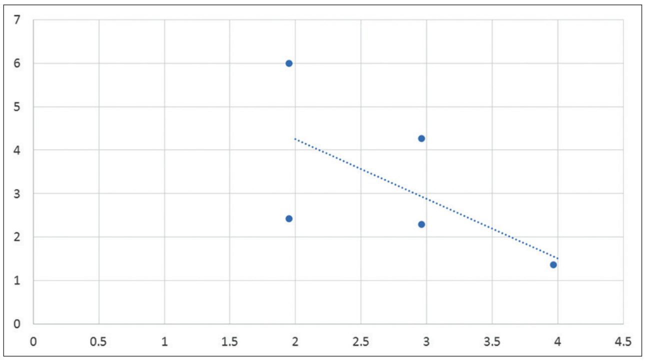
S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Lateral sway EO (Mean±SD)	Correlation value
1	5	2.8±0.83666	3.64±1.77144	−0.1

BBS: Berg balance scale, SD: Standard deviation, EO: Eye open

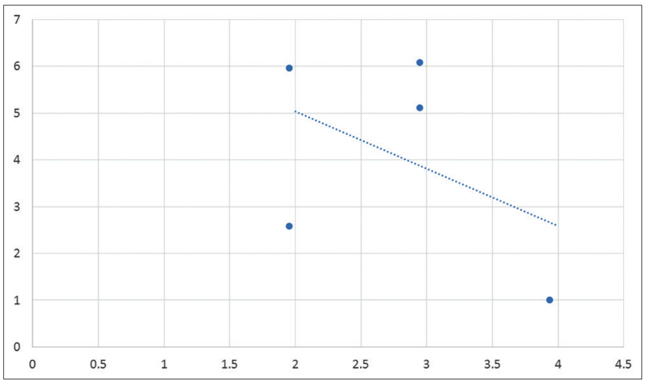
Table 27: Correlation between supinated foot and lateral sway-EC (unstable surface)

S.No	Number of subjects with supinated foot type	Supinated foot (Mean±SD)	Lateral sway EC (Mean±SD)	Correlation value
1	5	2.8±0.83666	5.56±2.02929	0.3

BBS: Berg balance scale, SD: Standard deviation, EC: Eye close

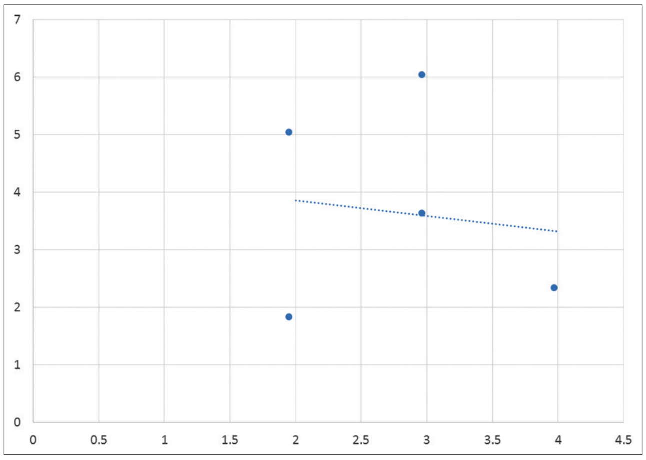


Graph 24: Correlation between supinated foot and lateral sway-eye open (stable surface)

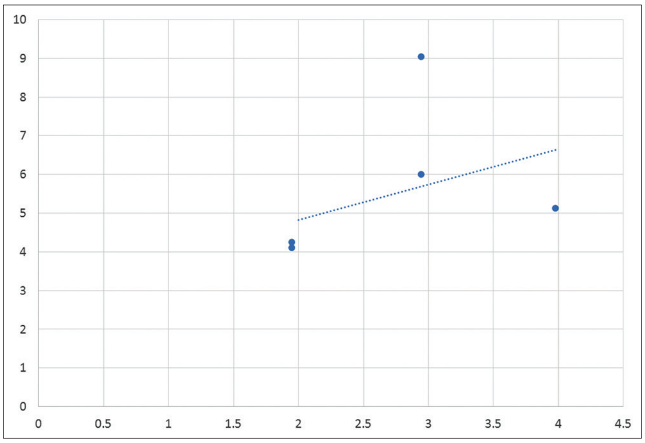


Graph 25: Correlation between supinated foot and lateral sway-eye close (stable surface)

Each of our foot 26 bones 33 joints more than 23 muscles, ligament, nerve and tendon. All these work together to support the weight of the body act as shock app push forward with each stride because feet are small compared to our whole body and they receive enormous impact during each day even for normal adults. Due to the process of aging the normal foot mechanism gets altered such as altered natural cushioning of pads arches gets flatter less flexible ankle and foot get wider and



Graph 26: Correlation between supinated foot and lateral sway-eye open (unstable surface)



Graph 27: Correlation between supinated foot and lateral sway-eye close (unstable surface)

longer. All these structural changes if no treated results in altered balance among older adults.

20 subjects were selected using 30 s sit to stand test and Romberg's test. The selected subjects' foot type was assessed using the navicular drop test. After classifying the subjects according to the foot type, they were measured for static and dynamic balance using BBS. For the same subjects, postural sway was assessed using Lord's Sway meter under four situations: (1) standing on stable surface (floor) open eyes, (2) standing on stable surface (floor) closed eyes, (3) standing on unstable surface (foam) with eyes open, and (4) standing on unstable surface (foam) with eyes closed.

The result showed strong-to-moderate correlation between foot type, balance and postural sway. Negligible correlation was found between this component Berg Balance Score and pronated foot, between pronated foot and anteroposterior in eye closed on unstable surface, and between neutral foot and lateral in eye close (EC) on stable surface. Weak correlation was found between Berg Balance Score and supinated foot, between pronated foot and lateral in EC on stable surface, and between neutral foot and anteroposterior in eye open (EO) on stable surface.

The certain component was difficult for the older adult such as standing on the unstable surface with EO and EC, turning 360°, standing on one leg, placing alternate foot on stool, and standing with one foot in front. Maximum support was giving during initiation of each situation to gain confidence of the subject and to increase their stability levels.

During standing and walking, pronation and supination of foot are essential movements of foot. However, if it is altered than the normative values, it can influence the balance and functional activities. From the result, it can be concluded that Berg Balance Score, i.e., static and dynamic balance was weakly influenced by the foot position. Where else, postural sway was influenced by the foot position.

CONCLUSION

The results showed strong-to-moderate correlation between foot type, postural sway, and balance; from this study, it is clear that foot position affects the balance among older adults.

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