International Journal of Science and Healthcare Research
Vol. 9; Issue: 3; July-September 2024
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Correlation of Pronated Foot Posture and Vertical Jump Measurement in Adolescent Recreational Basketball Players - An Observational Study

Ramani Hardik A.[1], Dr. Yagna U. Shukla[2], Dr. Manmitkaur A. Gill[3]

[1,2,3]Government Physiotherapy College, Government Spine Institute, Civil Hospital, Ahmedabad.

Corresponding author: Ramani Hardik A.

DOI: https://doi.org/10.52403/ijshr.20240302

ABSTRACT

Background: Jumping is a significant move commonly performed by basketball players, with an average of 44 jumps completed by each player during a competitive game. The influence of foot pronation on the mechanics of the lower extremities in basketball players' movements, particularly during repeated jumps and various landing techniques, is a significant area under investigation.

Methodology: After receiving ethical approval, a total of 250 individuals underwent screening. Out of these, 85 participants were selected for the study on specific criteria and convenience sampling. Prior to the commencement of the study, written consent was obtained from the parents of the participants, along with their assent. The participants were then categorized into different groups based on their navicular drop, with Group 1 (consisting of 42 individuals) exhibiting a pronated foot posture, and Group 2 (comprising 43 individuals) displaying a neutral foot posture. Subsequently, the Sargent jump test was conducted on all participants, and the data obtained was analyzed for both groups.

Results: Data from basketball players were examined using SPSS 16.0. After conducting an unpaired t-test (p=0.15, Df= 83, t= 1.43) and a Pearson correlation test (r=0.12 and r=0.08), it was found that there was no statistically significant correlation between pronated foot posture and vertical jump performance.

Conclusion: This research study has determined that there is no connection between a pronated foot position and the vertical jump height among young recreational basketball players.

Keywords: Pronated foot, Navicular drop, Vertical jump, Adolescent, Basketball players.

INTRODUCTION

Basketball stands out as a widely favored team sport enjoyed and followed globally. This dynamic and technical ball game involves two teams, each comprising five players, striving to score points by shooting the ball into the opposing team's basket [(1)].

Within the game, players engage in a series of movements involving leaps, sprints, rapid changes in direction, and lateral cuts. Jumping features prominently among the maneuvers executed by basketball players, with an average of 44 jumps performed per player in a competitive match [(2)].

These jumping actions are integral to both defensive activities such as blocking, rebounding, and stealing, as well as offensive strategies like passing, rebounding, and shooting. In real-game scenarios, players are not only tasked with executing numerous jumps but also with doing so competitively

against opponents from the other team, aiming to outperform them in different gameplay situations [3].

Thus, enhancing one's jumping ability becomes a key objective for basketball players, regardless of their playing positions - be it guard, forward, or center. This improvement, along with refining proficiency in other defensive and offensive actions required during a game, is crucial for player development and performance [3].

The foot pronation's impact on lower extremity mechanics in the context of basketball players' movements, particularly during repeated jumps and varied landing mechanisms, is a key area of investigation. Moreover, given the potential association between foot pronation and specific injuries like medial tibial stress syndrome and patellofemoral pain, understanding this relationship is essential in the realm of basketball athleticism [4]. The correlation between a pronated foot posture and vertical jump performance in recreational basketball players is the focus of this study.

NEED OF THE STUDY

- The foot arch plays a vital role in transferring force, absorbing shock, and storing elastic energy in the connective tissues of the arch, including bones, tendons, and ligaments. This energy is then released as the feet recoil from the ground.
- It is common practice to recommend orthotic devices for individuals with pronated feet to preserve the medial longitudinal arch and prevent a range of associated problems. Despite ongoing debates on whether pronated feet contribute to injuries, some studies suggest that pronation can impact the entire kinetic chain, potentially leading to overuse injuries like tibialis posterior tendonitis, patellofemoral syndrome, ligament stress, shin splints, and plantar fasciitis.
- Understanding the impact of foot posture on vertical jump performance in recreational basketball players is essential.
- The aim of this research is to explore the relationship between increased navicular drop or low arched feet and jump performance among basketball players.

Objectives

- Investigating the relationship between pronated foot posture and vertical jump performance among adolescent recreational basketball players.
- Exploring how neutral foot posture affects vertical jump height in adolescent recreational basketball players.

HYPOTHESIS

NULL HYOTHESIS (H_0)

$H_0$1: There is no significant correlation of pronated foot posture with vertical jump measurement in adolescent recreational basketball player.

$H_0$2: There is no significant correlation of neutral foot posture with vertical jump measurement in adolescent recreational basketball player.

ALTERNATIVE HYPOTHESIS (H_1)

$H_1$1: There is significant correlation of pronated foot posture with vertical jump measurement in adolescent recreational basketball player.

$H_1$2: There is significant correlation of neutral foot posture with vertical jump measurement in adolescent recreational basketball player.

MATERIALS AND METHODS

Study Design: An observational study.

Study Setting: This study was conducted at Various sports academies in Ahmedabad.

Study Duration: 3 months.

Sample Population: "Recreational Basketball players"

Sampling Method: Convenience Sampling.

Sample Size: 85

Pronated foot posture: 42

Neutral foot posture: 43

Calculation:

$N=[(Z_a+Z_b)/C]^2 + 3 = 85$

$a = Z_a = 1.9600$

$b = Z_b = 0.8416$
$C = 0.5*In[(1+r)/(1-r)] = 0.3095$

SELECTION CRITERIA

Inclusion criteria

1. Subjects willing to participate.
2. Age group between 11-18 yrs.
3. Recreational basketball players- They should be playing for ½ - 3 hours per session and at least 3 times a week.
4. Males and females both are included.
5. Athlete having B/L neutral feet.
6. Athlete having B/L pronated feet (flexible).

Exclusion criteria

1. Players having foot deformities other than pronated feet (flexible).
2. Presence of any traumatic or non-traumatic lower limb orthopaedic, neurological and cardiovascular conditions.

Withdrawal criteria: Individual willingness to discontinue.

OUTCOME MEASURE

- NAVICULAR DROP TEST (mm) [7][8]
- SARGENT JUMP TEST (cm) [9][10]

MATERIALS

1. Consent form.
2. Assent form.
3. Assessment form.
4. Small rigid ruler.
5. Wall mounted scale.
6. Measure tape.
7. Chalk.
8. Pen, pencil and Paper.

PROCEDURE

Ethical approval was obtained from the institute's ethical committee for the current research project. Out of 250 subjects, screening was conducted based on specific criteria and the Physical Activity Readiness Questionnaire (PAR-Q). Subsequently, 85 subjects were selected conveniently. Following a detailed explanation of the procedures, written consent was taken from the parents of the participants and written assent forms were obtained from the participants. Participants were then requested to provide their demographic information and any relevant medical history. After collecting the necessary demographic data, each participant underwent foot posture assessment and the Sargent jump test.

Based on the foot posture assessment, participants were categorized into two groups:

1. Pronated foot posture group
2. Neutral foot posture group

Navicular drop test (NDT), The difference in any measurement greater than 10 mm is considered foot pronation [5]. Measurement below 10 mm is identified as normal foot.

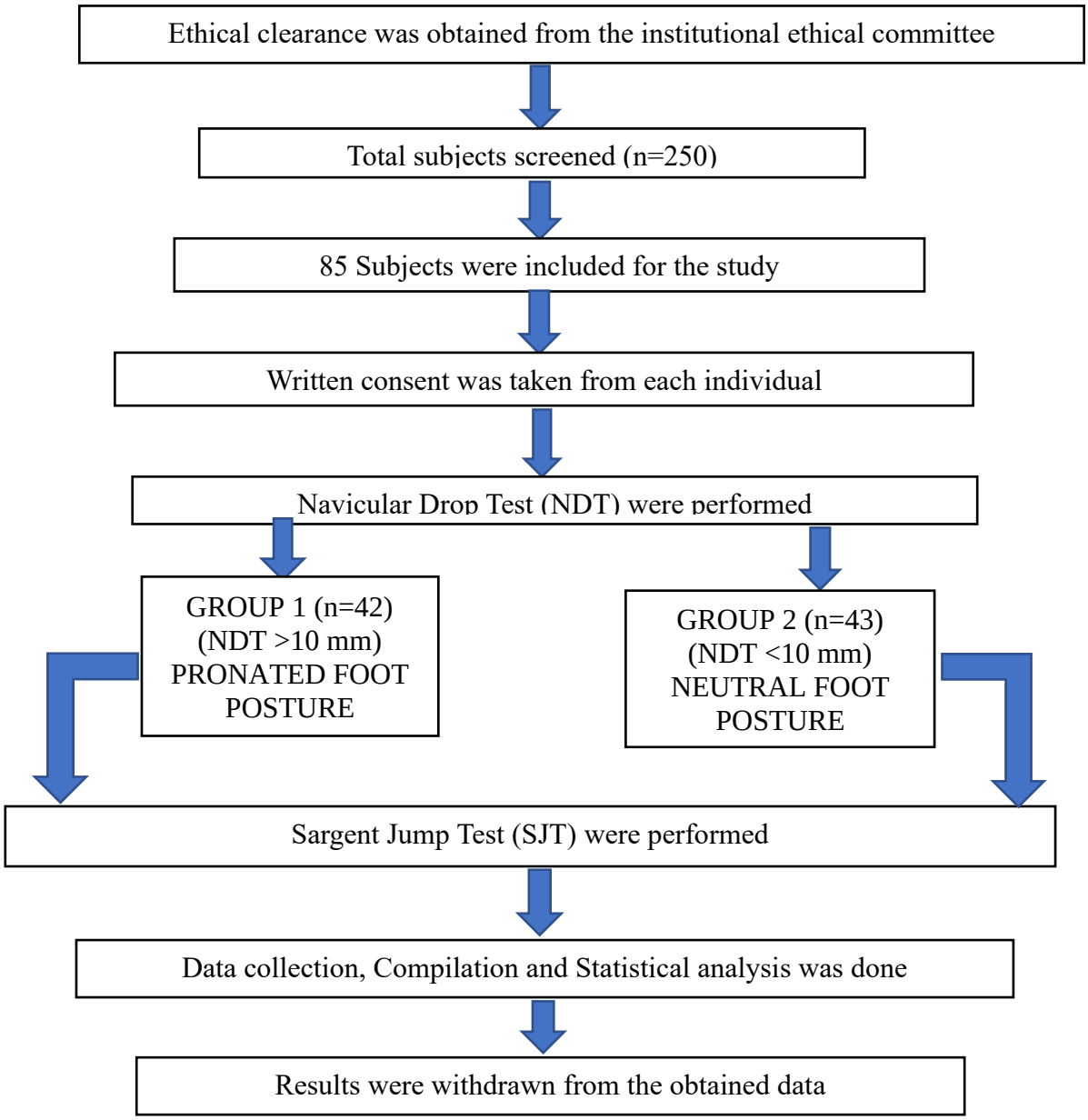
SCORING TABLE FOR SARJENT JUMP [6]

ATING	MALE (cm)	FEMALE (cm)
EXCELLENT	>65	>58
ABOVE AVERAGE	50-65	47-58
AVERAGE	40-49	36-46
BELOW AVERAGE	30-39	26-35
POOR	<30	<26

STATISTICAL ANALYSIS

Statistical analysis in this study utilized SPSS version 16.0 and Microsoft Excel 10, maintaining a significance level of 5% and a confidence interval of 95%. The data underwent screening for initial comparisons and normal distribution before proceeding with the statistical tests. Comparative analysis between groups was carried out based on the initial outcome measures.

FLOW CHART OF THE STUDY PROCEDURE:



RESULT

The current study was done to evaluate any connection between foot pronation and jump height difference. Number of participants were 85. Table 1 depicts demographic characteristic of all individuals.

Table 1: Demographic characteristics of both the Groups.

CHARACTERISTIC	GROUP 1 MEAN±SD	GROUP 2 MEAN±SD
AGE (years)	14.50±1.75	14.38±1.89
BMI (kg/m$^{2)}$	20.38±2.09	20.07±2.49
NAVICULAR DROP (RT.) (mm)	1.42±0.24	0.55±0.17
NAVICULAR DROP (LT.) (mm)	1.45±0.18	0.52±0.21
SARGENT JUMP TEST (cm)	39.45±4.94	41.06±6.05

Unpaired t-test was applied to compare the vertical jump values of group 1 having pronated feet posture and group 2 with neutral feet posture. As illustrates in graph 1

and table 2, there were no difference between the jump performance in both the groups was noted (p=0.15, Df= 83, t= 1.43). Hence the alternative hypothesis was rejected and null hypothesis accepted.

Graph 1: Vertical Jump values of both the groups.

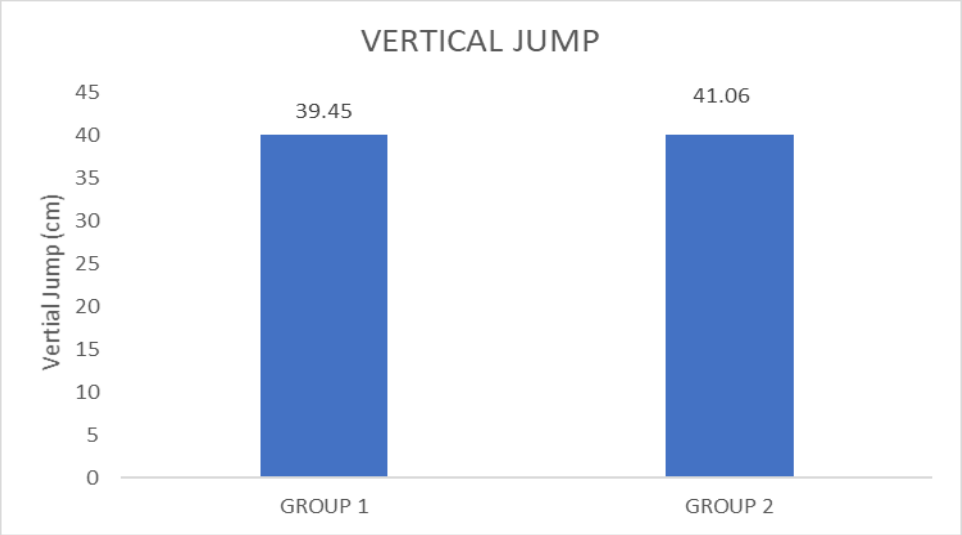
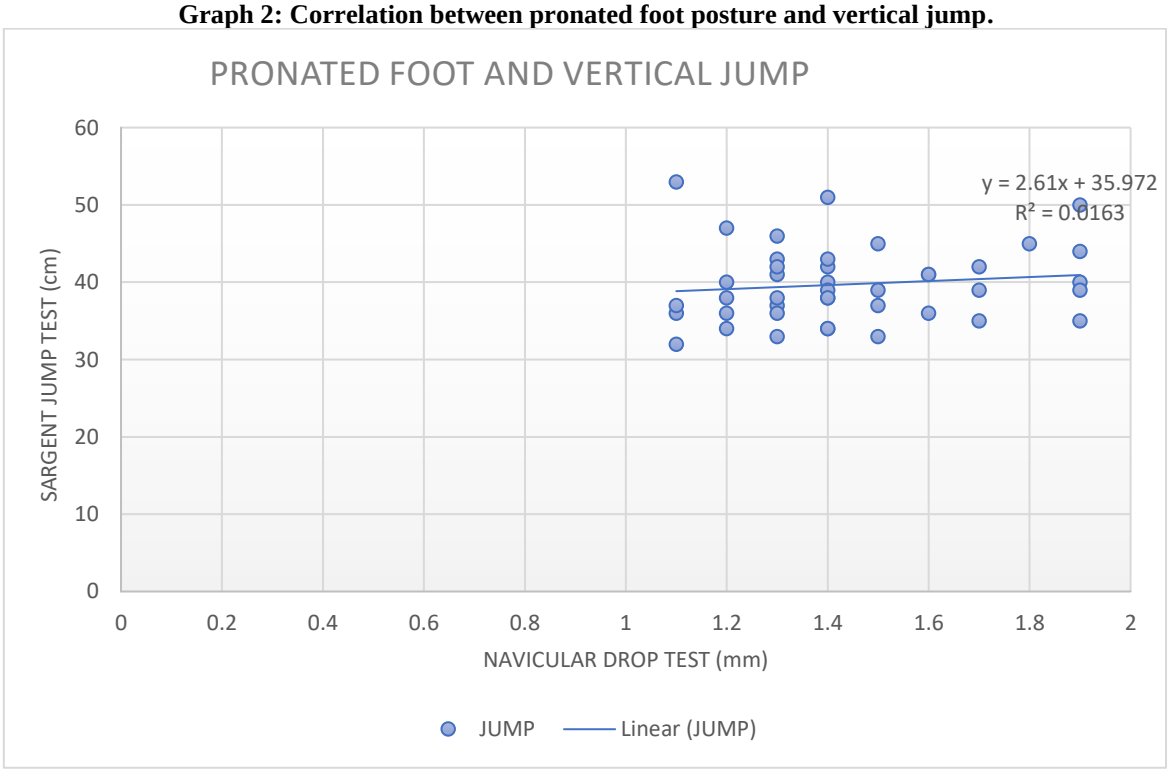


Table 2: Vertical Jump values of both the groups.

GROUP	No. of subjects	MEAN±SD(In cm)	P-value
GROUP 1	42	39.45±4.94	0.15
GROUP 2	43	41.06±6.05	

Also Pearson correlation test was applied in both the groups to check the correlation of feet posture with vertical jump performance. Graph 2 with r value 0.12 show group 1 had negligible correlation of pronated feet posture with jump performance.

Graph 2: Correlation between pronated foot posture and vertical jump.



DISCUSSION

The present study was conducted to determine the correlation of pronated foot posture and vertical jump measurement in adolescent recreational basketball players. This study was conducted on 85 players who were recreational basketball players. They were allocated into 2 groups Group 1 (pronated foot posture group) and Group 2 (neutral foot posture group).

Foot Posture was assessed by Navicular Drop Test and Vertical Jump Performance was assessed by Sargent Jump Test.

The main finding in the present study was that there was no significant correlation of foot posture and vertical jump performance.

Malia Ho, Pui Wah Kong at el (2019) shown the use of foot orthoses resulted in biomechanical changes in both the normal-arched and flat-footed groups but does not enhance jumping performance in basketball players [(2)].

Fu Fengqin, Wang Sheng at el (2016) concluded that the kinematic and plantar pressure differences in the foot between the two groups during vertical jump were relatively large, people with flat-arched feet demonstrated greater peak pressure in hallux, larger flexion and abduction of the knee during landing phase. These findings suggested that people with flat-arched feet may increase the risk of injuries, because of the poorer ability of self-regulation [(11)]. Which shown different biomechanics of both the foot posture but does not conclude about jump performance.

Anton Tudor, Lana Ruzic at el (2008) stated that Our findings are just a contribution to the overall understanding of the functionality of flat feet and possibly related problems. According to our results, no disadvantages for sport performance originating from flat-footedness were confirmed. It seems that foot flatness does not affect lower leg motor abilities, so accordingly, the application of standard corrective insoles with the purpose to improve athletic performance in children aged 11 to 15 years, as traditionally advised by many, is at least questionable and maybe even not advisable [(12)].

J.D. Michelson, D.M. Durant at el (2014) The Injury Risk Associated with Pes Planus in Athletes concluded that the existence of flat footedness does not predispose to subsequent lower extremity injury. The routine prophylactic use of orthotics in flat-footed athletes to prevent future injury may therefore not be justified based on the data available [(13)].

CONCLUSION

This study concludes that there is no correlation between pronated foot posture and decrease in vertical jump measurement in adolescent recreational basketball players. This study sends a clear message that pronated foot posture doesn't affect the vertical jump performance.

Acknowledgement: None

Conflict of interest: None

Source of funding: Study is not funded by anyone. No participants were burdened financially.

Ethical approval: Institutional ethical committee approved the study.

REFERENCES

1. Michael Duffy, Suefa Lee, Daniel Byrne. The Sports Book 5th Edition.
2. Malia Ho, Pui Wah Kong, Lowell Jia-Yee Chong and Wing-Kai Lam. Foot orthoses alter lower limb biomechanics but not jump performance in basketball players with and without flat feet, Journal of Foot and Ankle Research 2019.
3. Gal Ziv a, Ronnie Lidor. Vertical jump in female and male basketball players—A review of observational and experimental studies, Journal of Science and Medicine in Sport 13 (2010).
4. Holla Shobhalakshmi., S. and Bhat Anshitha. Association between elite basketball players and foot pronation, International Journal of Sports Sciences and Fitness, Volume 7(2) 2017.
5. David J. Magee, Orthopedic Physical Assessment, 6th Edition.
6. Brian Mackenzie, 101 Performance Evaluation Tests, 2005, Registered number: 3934419.

7. Juan Carlos Zuil-Escobar, PhD, a Carmen Belén Martínez-Cepa, PhD, a Jose Antonio Martín-Urrialde, PhD, a and Antonia Gómez-Conesa, PhDb, Medial Longitudinal Arch: Accuracy, Reliability, and Correlation Between Navicular Drop Test and Footprint Parameters, Journal of Manipulative and Physiological Therapeutics, Volume 41, 2018.
8. Renata Vauhnik, Zmago Turk, Iztok A Pilih,Dušanka Mičetić-Turk, Intra-rater Reliability of using the Navicular Drop Test for measuring foot pronation, Hrvat. sportskomed. Vjesn. 2006; 21: 8-11.
9. Paulo Gil da Costa Mendes de Salles, Fabrício Vieira do Amaral Vasconcellos, Gil Fernando da Costa Mendes de Salles, Renato Tavares Fonseca, Estélio Henrique Martin Dantas, Validity and Reproducibility of the Sargent Jump Test in the Assessment of Explosive Strength in Soccer Players, Journal of Human Kinetics volume 33/2012, 115-121.
10. Tine Sattler, Damir Sekulic, Vedran Hadzic, Ognjen Uljevic, and Edvin Dervisevic, Vertical jumping tests in volleyball: Reliability, Validity, and playing-position specifics, The Journal of Strength and Conditioning Research · September 2011.
11. Fu Fengqin, Wang Sheng, Shu Yang, Li Jianshe, Sergey Popik, Gu Yaodong, A Comparative Biomechanical Analysis the Vertical Jump Between Flatfoot and Normal Foot, Journal of Biomimetics, Biomaterials and Biomedical Engineering, 2016.
12. Anton Tudor, MD, PhDa, Lana Ruzic, MD, PhDb, Branko Sestan, MD, PhDa, Luka Sirola, MDa, Tomislav Prpic´, MD, Flat-Footedness Is Not a Disadvantage for Athletic Performance in Children Aged 11 to 15 Years, PEDIATRICS Volume 123, Number 3, March 2009.
13. J.D. Michelson, D.M. Durant and E. McFarland, The Injury Risk Associated with Pes Planus in Athletes, American Orthopaedic Foot & Ankle Society, 2002.

How to cite this article: Ramani Hardik A., Yagna U. Shukla, Manmitkaur A. Gill. Correlation of pronated foot posture and vertical jump measurement in adolescent recreational basketball players-an observational study. *International Journal of Science & Healthcare Research.* 2024; 9(3): 6-12. DOI: *https://doi.org/10.52403/ijshr.20240302*

******