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Article

Research on the difference in plantar biomechanics among dance majors

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Abstract: Dance majors' plantar biomechanics studies the functional and structural dynamics of their feet as they perform different dance moves and techniques. The primary objective is to comprehend which distinct dancing styles and approaches affect plantar biomechanics to possibly identify risk factors for injuries and guide dancers on how to prevent them. Dancing requires precise body alignment and movement, which leads to certain foot biomechanical variations that are vital for preventing injuries and improving performance. Distinct plantar biomechanics within dance majors (ballet and jazz) are examined to identify novel biomechanical factors. One hundred and fifty all fifty jazz dancers, fifty ballet dancers, and fifty non-dancers participated in the study. A 3D foot scanner and pressure measuring system are utilized for assessing variables such as arch elevation (AE), plantar pressure dispersion (PPD), and foot position (FP). Additionally, tests of gait ability using distinct foot biomechanics are carried out in various dance-related motions. For comparative assessment of such dancer groups, statistical techniques like ANOVA and KRUSKAL-WALLIS tests are used. Types of dance show different PPD formations, with jazz dancers including maximum MIDFOOT pressure (MFP) and ballet dancers including maximum forefoot pressure (FFP), and both dancer groups have stronger ankle flexibility and toe flexion. Future research needs to assess the consequences of training plans and long-term modifications to gain an improved comprehension of how the biomechanically unique feet of dance majors necessitate targeted interventions for injury prevention and performance improvement.

Keywords: plantar biomechanics; dance majors; foot biomechanics; pressure dispersion; injury prevention

1. Introduction

1.1. Introduction to plantar biomechanics

Dancers rely greatly on the flexibility, durability, and structural integrity of their feet, which maintain their body weight and enable complicated motions connecting twenty-six bones, thirty-three joints, and a difficult network of muscles, ligaments, and tendons. It is essential to comprehend the plantar biomechanics of dancers since they are different from non-dancers in terms of force distribution, toe flexion, and ankle stability, all of which have an impact on presentation and the prospect of injury [1]. These biomechanical adjustments improved midfoot force and ballet dancers' enhanced forefoot pressure reproduces unique progress demands and foot adaptations that trainers must take into account for capable preparation and injury avoidance approaches. By incorporating this realization in dance learning, qualities like dedication and self-control which are essential for achievement in dance are enhanced in addition to body health [2].

1.2. Significance of foot function: Dancing approach

The foot serves as a dynamic stage that is essential for strength growth, stability, and mobility in dance. Because of its flexibility, it facilitates exact motions, reduces shock to avoid injury, and offers vital sensory in sequence for balance and spatial awareness. These are essential for carrying out complex dance moves and preserving the caliber of the entire performance. Any injury or illness to the skeletons, tendons, ligaments, or other types of soft tissues associated with the leg could result in discomfort with the impacted region of the feet' surroundings and lack the opportunity or practice in dancing. Conversely, certain types of heel pain may be a sign of particular medical conditions. It could be challenging to check for injuries on ballet dancers, and Jazz dancers are more inclined to suffer injuries associated with rapid movement of the feet, dynamic motions, and abrupt direction changes [3]. By employing biomechanics concepts, an osteopath may create an understandable representation of the therapy strategy getting a fundamental grasp of the physiology of the foot and ankle. Ankle rotation and plantar flexion are severe situations in which dancers frequently find difficulty. Symmetry upward the link is supported by a robust, erect leg [4]. Ballet performers and jazz performers, whether amateur or competent are a significant risk of injury to the feet and ankles due to improper positioning. The prevention of injuries to the foot and ankle enhances the power of agility contingent on correct positioning [5]. **Figure 1** provides insights into the levels of discomfort and difficulties experienced by patients with different types of foot injuries by mapping out various foot injuries and explicitly identifying the pain positions interconnected with each type.

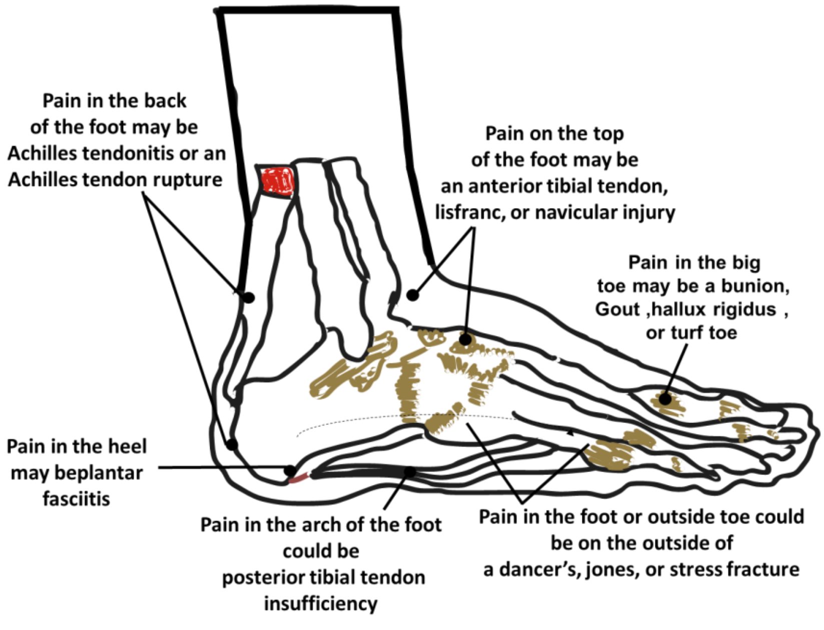


Figure 1. Foot injury infection area chart.

1.3. Injury prevention exercise

Repeated significant effects in motion have a huge negative influence on dancing students' productivity and wellness, if the dancers improperly handle the steps that can result in accidents. The knowledge of heel anatomy, the study of loads applied to the heel, and the area of one's feet throughout the motion, could assist with the development of focused injury prevention exercises. To avoid prevalent ailments such as stress-induced fractures, heel tendon inflammation, and foot inflammation, dancing enthusiasts ought to enhance these characteristics [6,7]. Workouts target ankle security, a sense of balance, and the development of feet in both the external and internal musculature were considered helpful to building up the body. Training increases the functionality of legs and feet, such as leg extensions, toe curves, and balancing exercises, which can help to ensure greater stability and absorbent properties throughout the movements associated with dancing [8,9]. It's possible that the prior method of examining plantar biomechanics in dance majors lacked specificity in terms of biomechanical parameters and how they related to different kinds of injuries. It frequently examined dance genre differences in general terms without delving further into specific biomechanical variances that can impact injury risk. This study uses cutting-edge technologies, including 3D foot scanners and extensive pressure monitoring devices, to overcome prior restrictions and accurately examine plantar biomechanics in dance majors. Through a concentration on certain variables such as plantar pressure dispersion, foot posture, and arch elevation in ballet and jazz dancers, the goal is to find distinct biomechanical aspects that impact injury risks and performance outcomes.

1.4. Objective of the analysis

- Examine the differences in the foot biomechanics of dance majors to learn that body alignment and movement impact the health and function of the feet.
- Analyze the foot biomechanics of jazz and ballet dancers using pressure sensors and 3D foot scanners, paying particular attention to arch dynamics, pressure distribution, and foot placement during dance moves.
- Determine the most prevalent foot injuries sustained by dancers and connect these conclusions to biomechanical information gathered from study subjects.
- Examine the foot biomechanics of dance majors to fill in research gaps and offer suggestions for future research and injury prevention techniques.
- The biomechanical variables influencing performance and injury risk in dancers and non-dancers, statistical techniques like as ANOVA and Kruskal-Wallis tests can be used to compare them.

2. Related work

The International Association for Dance Medicine and Science Bibliography with six internet databases [10] was searched to perform a scoping study. The way athletes rotate, fusing biomechanical expertise with the samba dancer's unique rotation style was analyzed in [11]. To investigate if balance and plantar pressure distribution (PPD) varies across five distinct ballet methods and are correlated with the adolescent ballet dancers' agonist-to-antagonist strength performance of the muscles in their ankle, knee, hip, and trunk were covered in [12]. A maple hardwood floor on concreted subflooring was contrasted with the average and peak of average amplitude EMG output from eight repetitions of leaps performed by eight dance students or active dancers on low-stiffness floors. To compare the lower limbs biomechanics in whole foot and forefoot (FT) [13] dancers. To determine whether increased plantar loading during walking, running and athletic movements could predict the risk of future bone stress injuries (BSI) [14] in elite collegiate runners when combined with medical risk factors like the Female and Male Athlete Triad components. The landing mechanics and ankle strength of dancers with and without chronic ankle instability (CAI) during the leap were compared in [15]. To investigate the impact of eight weeks of strength and balance exercises combined with ballet training on gait patterns five basic ballet movements were performed on a single leg [16]. Balance and plantar pressure distribution (PPD) [17] differed across five different ballet approaches and correlated with teenage ballet strength performance of the muscles in their ankle, knee, hip, and trunk.

3. Investigation of plantar biomechanics among dance majors

With an emphasis on foot anatomy, functioning, and gait trends, this research investigates plantar biomechanical in dancing fields. Dancing enthusiasts have a great deal of foot throughout the rigorous education. To avoid accidents, one must comprehend plantar biomechanical. To provide ideas for avoiding injuries as well as skill development, studies could investigate the effects of elements such as shoes, floor substrates, and conditioning regimens on the plantar biomechanical to enhance dancers fields' intellectual and creative growth, the research intends to advance our understanding of feet biomechanics.

3.1. Data collection

150 people participated in the study: fifty of them were non-dancers (ND), fifty of them were jazz dancers (JD), and fifty of them were ballet dancers (BD). To guarantee reliable and accurate data collection on plantar biomechanics, a well-established methodology was employed. With presentations from non-dancers as controls and applicants from dance fetters, the study expected to consider an extensive range of foot systems. This intentional circulation prepared it probable to associate and evaluate the plantar biomechanics of dancers through implementation in ballet and jazz, given that perceptive material about the alterations then resemblances concerning individuals with unpredictable movement environments.

3.2. Selection criteria

This section is the primary part of this investigation, it has two parts, one is inclusion and another one is exclusion criteria.

a) Inclusion criteria
- Active enrollment in a recognized academic program with a dance major.
- Engagement in performance or training activities related to dance.
- The existence of foot or lower limb biomechanical problems or injuries connected to dancing, either self-reported or verified.

b) Exclusion criteria
- History of major lower limb injuries not related to dance practice.
- Incapacity to engage in biomechanical evaluations because of health issues or physical restrictions unrelated to dancing.

3.3. Data splitting

50 non-dancers (ND), 50 jazz dancers (JD), and 50 ballet dancers (BD) willing for the learning inclusive of 150 applicants. To guarantee dependable and precise data collection about plantar biomechanics, the study utilized a thoroughly tested approach. Three groups were carefully chosen from among the participants: ND, JD, and BD. This intentional clustering made it possible to examine and contrast plantar biomechanics thoroughly across a variety of association backgrounds, provided that insightful into sequence about the differences and similarities among people with diverse backgrounds in dance training.

a) Non-Dancers (ND) group

There were 50 people in this group, and none of them had ever danced ballet or jazz. They perform the role of the research's manage group, giving a comparison with the groups that received dance teaching at baseline. The investigators were able to look at normal foot mechanics in people without specific movement training since ND were integrated into the research.

b) Jazz Dancers (JD) group

In this group, fifty people were actively involved in jazz dance. Related to ballet or non-dancing people, jazz dancers' distinctive undertaking patterns and methods could have a different impact on their foot mechanics. The purpose of involving jazz dancers in the study was to investigate the effects of particular dance genres on plantar biomechanics.

c) Ballet Dancers (BD) group

Also, that group involved50 ballet dancers. The detailed footwork, pointe movement, and precise weight circulation required for ballet dance have an immense effect on the biomechanics of the foot. Investigators were able to associate and distinguish the biomechanical individualities of ballet dancers, jazz dancers, and non-dancers acknowledgments to this group.

3.4. Assessing dancers' foot biomechanics

a) The function of the foot

The intricate structure of the foot is vital to human movement, equilibrium, and weight support. It is composed of many ligaments, muscles, tendons, and bones that work together to support and enable movement of the body.

b) Planter biomechanics in dancers

Plantar biomechanics is the investigation of how a dancer's foot impacts the ground during a dance step. This includes analysis of the foot arches, forces used, flexion and supination, and variations specific to ballet or jazz, among other dance styles.

c) Types of plantar biomechanics injuries in dancers

Dancers are more likely to experience injuries such as plantar fasciitis, metatarsal pressure injuries, and Achilles tendonitis. These harms are repeatedly initiated by repetitive indications, exploitation, inappropriate footwear, or insufficient retrieval stages.

d) Identification of prior methods constraints in dancer foot biomechanics

To carefully understand dancer foot biomechanics, more investigation wants to be completed in an amount of areas, counting evolving common tools for measuring for active dance activities, including cutting-edge skills including programmer recording into regular training practices, authorizing approaches for escaping damages specific to dancers, and conducting longitudinal educations that track variations in the foot over lengthy periods of period. Our empathetic of dancer's foot fitness, injury prevention, and presentation development approaches will advance with the addressing of these shortages.

e) Research objectives

Investigative the differences in plantar biomechanics through dance majors through a concentration on jazz, ballet, and non-dancers is the impartial of this exploration. Using 3D foot scanners and pressure determining tools, the exploration will consider variables such as arch elevation plantar pressure diffusion, and foot spot throughout dance interrelated gestures. The study intentions to inspect the alterations in gait ability and biomechanical features among different dance categories through a relative analysis using numerical procedures like ANOVA and Kruskal-wall is assessments.

3.5. 3D foot scanner and pressure measuring system

a) 3D foot scanner

To obtain comprehensive weight-bearing images of both feet, the use of 3D foot scanners was necessary. The volunteers were instructed to maintain a straight posture with their toes in line, and maintain their arms effortlessly at their sides or placed up against a support. These scanners use a fixed array of sensors and projectors to efficiently convert digital images into precisely detailed 3D representations. By carefully mapping foot anatomy, 3D foot scanners provide dance students with invaluable insights into plantar dynamics. They show the complex interactions among foot components during dance movements, making it easier to evaluate how various dance genres affect foot biomechanics. This thorough knowledge reduces the chance of injury and increases productivity by enabling well-informed modifications to be made to exercises, orthotics, and equipment that are designed to treat biomechanical abnormalities or stress points.

b) Pressure measuring system

The study concentrates on creating small, portable, and environmentally friendly network designs for medical sensors due to the quick advances in wireless networking, manufacturing, and surveillance apparatus technology. Preventing injuries, managing risks and maintaining general health depend upon early detection of issues with the feet. Plantar pressure characteristics are used to measure the health of the foot, accurate and reliable methods are essential. To stay up to date with a fast-changing research environment, researchers studying gait analysis are creating techniques for real-time and in-situ evaluation of common components. Mobility, unfettering, shoe of sole placement and efficacy in the intended context would characterize the perfect system. Understanding this is necessary to comprehend how routine activities impact health.

3.6. Gait utility

Integrating performance responsibilities with foot health is difficult for dancing students. Dancers practice hard, placing a lot of strain on their arches; therefore a thorough grasp of heel mechanics is necessary. To perform intricate moves with grace and precision, dancers must preserve their foot endurance, suppleness, and steadiness. The heel mechanics allow dancers to seamlessly switch between various dance styles and approaches, allowing for a wide range of foot movements. Significant activity, injuries from repetitive stress, and poor execution all contributed to the prevention of foot injuries. Gaining knowledge of heel dynamics enables the detection and correction of mechanical deficiencies, maximizing motion usefulness and reducing foot-related problems. With this knowledge, dancers can achieve creative excellence and long-term foot wellness.

3.7. Statistical analysis to evaluate the discomfort while dancing

a) One way ANOVA

The unbiased evaluations of one-way ANOVA can be determined as an $w_{ji} \in \mathrm{R}, 1 \leq \mathrm{i} \leq m_j, 1 \leq j \leq l$ among l with various splitting of $O_1, \ldots, O_l$, decompositions of ANOVA have been illustrated in the Equation (1),

$$TSS = MSS + RSS \tag{1}$$

wherein,

$$TSS = \sum_{j=1}^{l} \sum_{i=1}^{m_j} (w_{ji} - \bar{w}..)^2 \tag{2}$$

$$MSS = \sum_{j=1}^{l} m_j (\bar{w}_j - \bar{w})^2 \tag{3}$$

$$TSS = \sum_{j=1}^{l} \sum_{i=1}^{m_j} (w_{ji} - \bar{w}_j)^2 \tag{4}$$

here, $\bar{w}_j. = \frac{1}{m_j} \sum_{i=1}^{m_j} w_{ji}$ represents j group-wise mean and $\bar{w} = \frac{1}{m_j} \sum_{i=1}^{l} \sum_{i=1}^{m_j} w_{ji}$ determines total mean values, thus the overall detection can be illustrated in the Equation (5),

$$m = \sum_{j=1}^{l} m_j \tag{5}$$

b) Kruskal-Wallis tests

Assume that we have got$h$, every value of ranges. Before calculating the total of various rankings on variables inside every collection, this will allow us to execute the Kruskal-Wallis test on every value and provide every collection with its own combined ranking. The examination of the statistics is as follows whenever there is a tie across all values as follows in Equation (6):

$$G = \frac{12}{M(M+1)} \sum_{j=1}^{k} \frac{Q_j^2}{m_j} - 3(M+1) \tag{6}$$

where in M represents the sum of each value across all samples. m_j Denotes the number of items present within it j-th samples, as well as Q_j represents the total number of rankings j-th samples. In addition to rearranging the order of operations, additionally, we should split $the\ G$as shown in Equation (7),

$$D = 1 - \frac{\sum_{j=1}^{h}(s_j^3 - s_j)}{M^3 - M} \tag{7}$$

Whenever the data are regularly distributed with equal variances, ANOVA is used to compare the means of three or more groups in order to ascertain whether there are any significant differences between them. When the data are not normally distributed or have unequal variances, on the other hand, a non-parametric alternative called the Kruskal-Wallis test is employed. The process examines the medians of several groups in order to pinpoint noteworthy variations. For evaluating statistical differences across groups in a variety of study scenarios, both tests are significant. JD, BD, and ND were compared in terms of performance ratings using statistical techniques, specifically ANOVA and Kruskal-Wallis tests. Utilizing ANOVA, the difference in performance ratings between the BD and ND groups was assessed. Because it enables the comparison of means across several groups to ascertain whether there are any statistically significant differences, this method is appropriate.

4. Result

In this study, we have analyzed the plantar biomechanics of JD, BD, and ND to comprehend the particular requirements imposed on a dancer's foot. Through the analysis of factors including heel form, stress shipment, and patterns of motion, we have pinpointed certain biomechanics traits linked to every group of JD, BD, and ND. This study contributes to the understanding of various dancing styles affect foot mechanics and enhance performance or prevent the risk of injury.

To analyze the flexion feet of dancers, we have considered tal crucial joints (TCJ), and talonavicular joints (TNJ) to estimate the dorsi flexion (DF) and plantar flexion (PF). TCJ is essential for lower-extremity functioning and heel biomechanical. TCJ makes it easier to perform DF and PF which are necessary for motions like dancing, jogging, and spinning. Performers need great foot mobility, power, and oversight to work properly helps to reduce the risk of injury and improve the execution. To maximize ordinary tasks and specialized motions in dancing and creative fields, one must comprehend the physical properties of this TCJ.

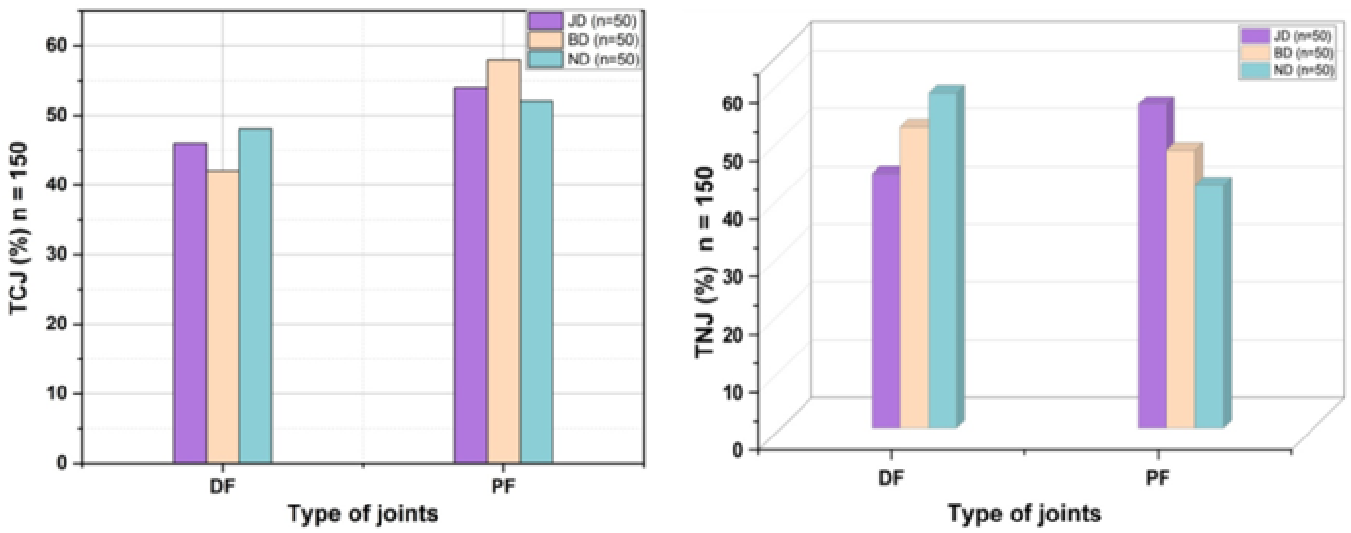
A vital component of the midtrial portion of the lower leg, the TNJ is essential to function the lower leg for dancers. It permits adaptations, security, and suppleness while moving. Accuracy and poise are essential for performers to have strong joints that help to lower the chance of damage. For dancing practices, the joint must be kept in good condition, and its biomechanical helps to create the exercise and recovery plans. The proportions of dorsiflexion (DF) and plantar flexion (PF) in talonavicular joints (TNJ) and talocrural joints (TCJ) among jazz dancers (JD), ballet dancers (BD), and non-dancers (ND) are compared in **Tables 1** and **2** and **Figure 2a,b**. Higher DF and PF values in dance majors (JD and BD) than in non-dancers are shown in both tables, suggesting that dance motions require more joint flexibility. These results highlight how dance training induces biomechanical changes that may lower the incidence of joint stiffness-related problems while improving performance.

Table 1. Comparison of TCJ.

Type of joints	TCJ (%) n = 150					
	JD n = 50	Proportion (%)	BD n = 50	Proportion (%)	ND n = 50	Proportion (%)
DF	23	46	21	42	24	48
PF	27	54	29	58	26	52

Table 2. Numerical values of TNJ.

Type of joints	TNJ (%) n = 150					
	JD n = 50	Proportion (%)	BD n = 50	Proportion (%)	ND n = 50	Proportion (%)
DF	22	44	26	52	29	58
PF	28	56	24	48	21	42



(a) **(b)**

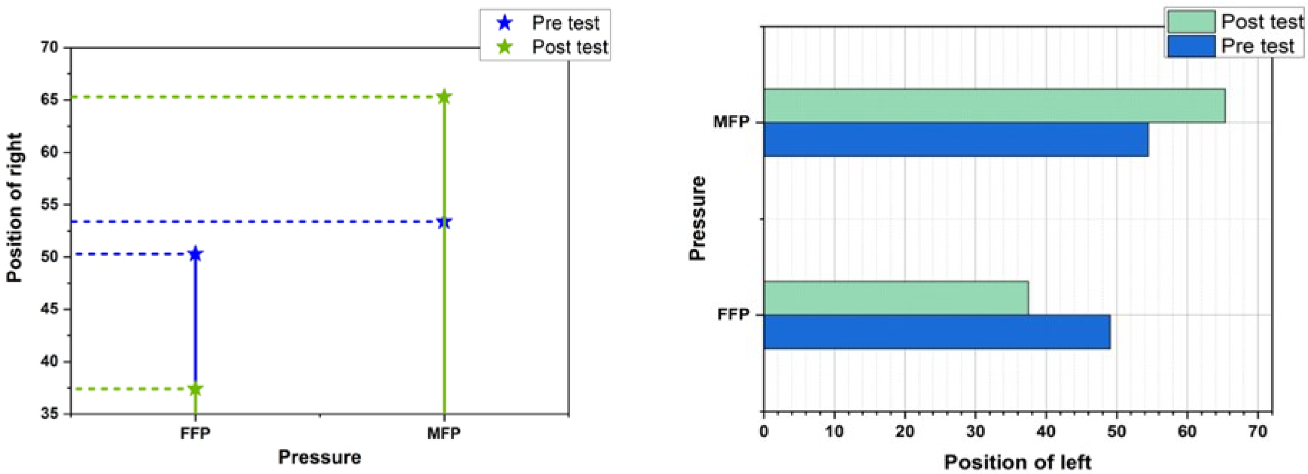
Figure 2. Graphical representation of DF and PF **(a)** TCJ; **(b)** TNJ.

The heel functioning involves midfoot pressure (MFP) particularly for dancers enthusiasts. It describes the stress distributed throughout the navicular, rectangular, and metatarsal joints in the center area in the feet when exercises involving weights are carried out. Maintaining the rigidity and suppleness within the feet through the appropriate MFP transfer, lowers the incidence of ailments including tendinitis, trauma fractures, and plantar fasciitis. In dancing, applying and control MFP may help to lower the risk of injuries. The MFP internal muscles may be strengthened with workouts that enhance the balance of MFP and foot biomechanics. To improve foot operation, efficiency and lifespan in dancing subjects can focus on therapies along with the instruction programs in aid of MFP analysis.

Dance majors apply significant heel strains since frequently perform foot-stressing maneuvers. The balance and strength of pressures applied to the forefoot pressure (FFP) during movements such as walking, running, dancing, and sitting. Dancer's apparel, level of activity, floor terrain, and method can all contribute to excessive metatarsal pressures. Comprehending heel stress facilitates the identification of possible wounds and the creation of focused therapies. **Table 3** presents the ranges of foot position (FP) with the arch elevation (AE) in pre-test and post-test. Pre-test and post-test findings for (a) right feet and (b) left feet for the JD, BD, and ND groups are shown graphically in **Figure 3**. The graphs highlight the variations and advancements seen in each group by visualizing the changes in performance parameters.

Table 3. Numerical values of pretest and post-test.

Foot Position (FP)	Arch elevation (AE)	parts	Pre-test	Post-test
Right feet	0.6	FFP	50.3	37.4
		MFP	53.4	65.3
Left feet	0.6	FFP	49.1	37.5
		MFP	54.5	65.4



(a) **(b)**

Figure 3. Graphical representation of pre-test and post-test **(a)** right feet; **(b)** left feet.

Whenever the data are regularly distributed with equal variances, ANOVA (Analysis of Variance) is used to compare the means of three or more groups in order to ascertain whether there are any significant differences between them. When the data are not normally distributed or have unequal variances, on the other hand, a non-parametric alternative called the Kruskal-Wallis test is employed. The process examines the medians of several groups in order to pinpoint noteworthy variations. For evaluating statistical differences across groups in a variety of study scenarios, both tests are significant.

Jazz dancers (JD), ballet dancers (BD), and non-dancers (ND) were compared in terms of performance ratings using statistical techniques, specifically ANOVA and Kruskal-Wallis tests. Utilizing ANOVA (Analysis of Variance), the difference in performance ratings between the BD and ND groups was assessed. Because it enables the comparison of means across several groups to ascertain whether there are any statistically significant differences, this method is appropriate. **Table 4** presents the numerical values of statistical assessment. ANOVA value of 11.10 ranges the *p*-value of 0.0001, 6.09 with a *p*-value of 0.20, and Kruskal-Wallis test obtained 7.02 with a range of 0.010, 9.25 with a *p*-value of 0.006.

Table 4. Numerical outcomes of ANOVA and Kruskal-Wallis test.

Statistical assessment	JD	BD	ND	*F*-statistics	*p*-value
ANOVA	5	6	4	11.10	0.0001
	9	8	7	6.09	0.20
	11	10	16	7.02	0.010
	13	15	13	5.03	0.19
	12	11	10	9.02	0.005
Kruskal-Wallis	7	11	12	10.02	0.008
	4	8	10	9.25	0.006
	13	15	9	8.15	0.007
	10	12	7	7.05	0.016
	16	4	12	11.25	0.0007

The percentage prevalence of typical plantar biomechanics injuries in ballet dancers (BD), jazz dancers (JD), and non-dancers (ND) is contrasted in **Table 5** and **Figure 4**. Due to their en pointe practice, ballet dancers have a significantly higher prevalence of plantar fasciitis (60%) than non-dancers have of Achilles tendonitis (5%). In contrast, the prevalence of Achilles tendinitis is significantly higher in all categories of people. Due to the physical demands of dancing, metatarsalgia and stress fractures are also common in both dance groups. Sesamoiditis and bunion, on the other hand, are quite common, especially in ballet and jazz dancers.

Table 5. Injuries ratio.

Types of Injuries	Values (%)		
	BD group	JD group	ND group
Plantar facilities	60	30	10
Achilles Tendonitis	57	38	5
Metatarsalgia	55	40	5
Stress fracture	50	40	10
Mortons Neuroma	55	35	10
Sesamoiditis	47	45	8
Bunion	50	45	5

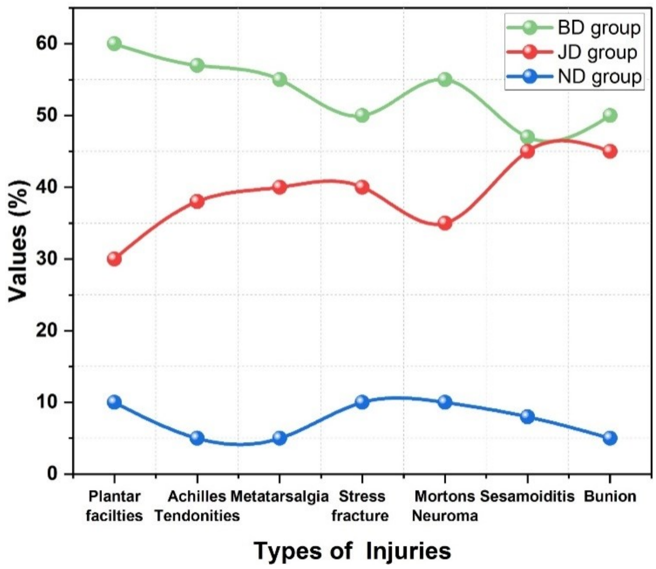


Figure 4. Comparative analysis of plantar biomechanics injuries across BD group, JD group, and ND group.

5. Discussion

The biomechanical differences between ballet dancers (BD), jazz dancers (JD), and non-dancers (ND) are highlighted in this study. Specifically, it is shown that ballet dancers have highest forefoot pressure (FFP), whereas jazz dancers have maximum midfoot pressure (MFP). Both dancer groups have better ankle flexibility and toe flexion than non-dancers. Increased MFP and decreased FFP are shown in the pre- and post-test results, with notable improvements in dorsiflexion (DF) and plantar flexion (PF) at the talonavicular joints (TNJ) and talocrural joints (TCJ). Substantial differences between groups are confirmed by statistical analyses utilizing the Kruskal-Wallis test (H-statistics of 10.02, p-value of 0.008) and ANOVA (F-statistics of 11.10, p-value of 0.0001).Due to their en pointe practice, ballet dancers have a significantly higher prevalence of plantar fasciitis (60%) than non-dancers have of Achilles tendonitis (5%).The diverse biomechanical requirements of a variety of dance genres are tinted by compare these outcome with other investigation, indicating that particular training regimens can maximize presentation and decrease injury danger. Practical ramifications include creating targeted exercises to enhance ankle and foot power, which is necessary for dancers and helps them stay in the profession longer while also developing their general wellbeing. It is necessary to integrate these biomechanical insights into training and treatment regimens to maximize dancers' potential and decrease their danger of injury.

6. Conclusion

The research illuminates the subtle biomechanical variation in dance majors' feet, emphasize the multifaceted association among training, body fitness, and the demands of different dance forms. The consequences highlight the significance of modified biomechanical evaluation and treatment to maximize effectiveness, keep away from injuries, and develop dancers' general health. ANOVA value of 11.10 ranges the p-value of 0.0001, 6.09 with a p-value of 0.20, and Kruskal-Wallis test obtained 7.02

with a range of 0.010, 9.25 with a p-value of 0.006. In the end, this information may help to improve dance science and promote dancers' the long-term health and performs excellence through the tailored training regimens, footwear design, and therapy tactics.

Limitations and future scope

The study of dance majors' plantar biomechanics may be limited by sample size, diversity, selection bias, biomechanical measurement techniques, temporal variations, external variables, and cross-sectional design. Addressing these issues is crucial for enhancing the study's validity and applicability. Programs for holistic health, performance enhancement, and injury avoidance might benefit from research on plantar biomechanics among dance majors. Technological developments and the long-term consequences of dance forms may have positive effects on sports science and the dance community.

Ethical approval: Not applicable.

Conflict of interest: The author declares no conflict of interest.

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