Phys. Educ. Sport Stud. Res. 3(2); 116-125 (2024)
DOI: 10.56003/pessr.v3i2.369

Physical Education and
Sport: Studies and Research

ORIGINAL RESEARCH Open Access

Effect of High Heeled Shoe Sole to the Vertical Jump Performance of Volleyball Women Student Athletes

Arjay Maiquez Olivar[1], Jomel Nasayao Reyes[2], John Paul Taguba Balisi[3], Teejay Dela Cueva Panganiban[4]

[1,2,3,4] Batangas State University TNEU JPLPC-Malvar, 4233, Philippines

Submitted : June 7, 2024
Accepted : September 21, 2024
Published : October 18, 2024

Abstract

Background: The study investigates the effect of wearing high heeled shoe soles on the vertical jump performance of volleyball women student athletes compared to their performance in standard footwear. This research aims to address the problem of whether high heeled shoe soles negatively affect vertical jump ability, which is a critical factor in their sport performance.

Objectives: This study investigated the influence of high heeled shoe soles on female volleyball athletes' vertical leap performance.

Methods: Using a quasi-experimental design, the study included 15 female volleyball student-athletes from Batangas State University TNEU JPLPC-Malvar Campus in 2023-2024. Participants performed vertical jump tests under two conditions—wearing high heeled shoe soles and standard footwear—over two weeks, with three attempts per condition. Paired t-tests assessed performance differences between the two footwear types.

Results: Results indicated that wearing high heeled shoe soles significantly improved jump heights, with average increases of 2.13 inches initially and 3.6 inches in post-tests. Statistical analysis yielded t-test values of 35.87 for pre-performance and 697.14 for post-performance, both showing significant gains.

Conclusion: The study concludes that high heeled shoe soles positively influence vertical jump performance in female volleyball athletes, suggesting that this footwear could enhance athletic outcomes.

Keywords: High heeled shoe sole, vertical jump performance, volleyball women student athletes.

*Correspondence: teejaypanganiban18@gmail.com
Teejay Dela Cueva Panganiban
Batangas State University TNEU JPLPC-Malvar, 4233, Philippines

INTRODUCTION

As a sport, volleyball demands a unique blend of physical attributes and skills, with explosive vertical jumps playing a pivotal role in both offensive and defensive aspects of the game. In recent years, athletic footwear has evolved significantly, offering athletes a wide array of options designed to enhance performance, comfort, and style (Miller et al., 2021). Among these innovations, high heeled shoe soles have gained popularity not only within the fashion industry but also among athletes, particularly in sports where vertical jumping is critical (Wójcik, 2019). Modern volleyball is developing in the direction of fast speed, comprehensive technology, changeable tactics, and fierce confrontation, and the requirements for volleyball players are getting higher and higher (Beigul, Shishkina, & Gatsura, 2022). Doing a good job in scientific selection has become one of the prerequisites for climbing the peak of volleyball (Proskurin & Stadnichenko, 2023). To select athletes who are passionate about volleyball, are in good physical condition, and have the prospect of training, it is essential to establish a scientific selection index system to provide references for the scientific selection of volleyball players.

The vertical jump is a fundamental skill in volleyball, allowing athletes to reach higher to block opponents' shots, spike the ball over the net, and retrieve balls that are out of reach. Therefore, any factor that influences an athlete's ability to perform an effective vertical jump is of utmost importance. According to Selisch et al. (2015), the countermovement vertical jump (VJ) and three-step, single-leg vertical jump (SLVJ) are common techniques to assess jump performance. In this context, high heeled shoe soles present an intriguing area of investigation, as they may introduce biomechanical changes that could either enhance or impede the athletes' jump performance. You can take your vertical leap to new heights by wearing the right insoles (Wang et al., 2020). Additionally, the stiffness of shoe soles has been linked to an increase in jump height, while also decreasing the effects of fatigue on the user. A 2.5 percent increase in vertical jump height was shown with the addition of a carbon fiber insole (Gregory et al., 2018; Selisch et al., 2015). In volleyball, one of the needs to improve is our vertical jump. It may affect how we effectively contribute to the teams such as spiking and blocking.

This study investigates the independent effects of changing heel height, forefoot shoe volume and upper material stiffness on plantar pressures and comfort in ladies raised heel shoes. The addition of the carbon fiber insoles increases stiffness, without any

permanent modifications to the shoe. Another modification that has been tested is the inclusion of elastic bands to the forefront of the shoe, allowing for more flexibility in the shoe (Chen et al., 2014). According to Noghondar et al. (2017), the purpose of this study was to examine the effect of shoe insole densities on impact shock attenuation, lower extremity biomechanics and performance during a jump-landing activity. This research aims to examine the effects of high heeled shoe soles on the vertical jump performance of volleyball student athletes. While high heeled shoe soles are primarily associated with fashion and everyday wear, their impact on athletic performance, specifically vertical jumping ability, has remained relatively unexplored in scientific literature. This study seeks to bridge this gap by examining the potential advantages or disadvantages that high heeled shoe soles may offer to volleyball players striving to improve their vertical jump height.

Novel shoe insoles, designed to provide sensory input to the feet using textured materials, have been investigated as a new technique to optimize gait in healthy youth. In this instances High Heeled Shoe Sole has become one of the best options to use to perform well in volleyball. According to Hatton et al. (2022) & Zheng et al. (2019), recent evidence suggests that textured insoles may also influence perceptual aspects of movement control in MS, which manifest as greater walking confidence and awareness of foot position. At this point toe-ground clearance is very low, only 1 to 2 cm, and in the event of tripping, balance must be recovered rapidly to avoid falling. Balance control is highly influenced by the foot center of pressure (CoP), influencing stability (Fujimoto et al., 2014).

To conduct a rigorous examination of the effects of high heeled shoe soles, the researchers will involve a sample of volleyball student athletes who will be tested under controlled conditions, both with and without high heeled shoe soles, during vertical jump assessments. The findings from this study may have practical implications for athletes, coaches, and sports footwear designers, potentially informing choices related to footwear for volleyball performance.

METHOD

Study Design and Participants

This experimental study was conducted to determine and examine the influence of high heeled shoe soles on the vertical jump performance of 15 Volleyball Women Student Athletes at Batangas State University TNEU JPLPC-Malvar Campus during the academic year 2023-2024. A within-subjects experimental design was used, with each participant

acting as their own control. Convenience sampling was employed to identify athletes who were conveniently available. The baseline vertical jump measurements were taken without high heeled shoe soles. The experiment spanned two weeks, and each athlete took a performance test once a week. Each test session consisted of three vertical jump attempts in two conditions: with and without high heeled shoe soles. During the post performance phase, players were instructed to wear high heeled insoles inside their usual athletic shoes. The findings were evaluated using paired t-tests to determine the significance of the changes in vertical jump performance between the two conditions.

Research Instruments

The vertical leap test was used in this study, and vertical jump heights were measured using a measuring tape fixed with masking tape to a stable vertical surface such as a wall. The method began with the athlete standing beside the wall, marking their standing reach height. Following that, they did a vertical jump and recorded the highest point they reached. This procedure was repeated for both situations (with and without high heeled insoles), and the outcomes were measured in inches.

Data Analysis

Statistical Analysis was performed using paired t-tests, to assess the significant differences in vertical jump result between the high heeled shoe sole and standard shoe sole.

RESULTS AND DISCUSSION

Results

Table 1 showcases the pre-performance measurements of participants on a vertical jump test, both without and with high heeled shoe soles. Without the high heeled shoe sole, the participants' vertical jump ranged from 156 to 170 inches, with a mean of 165.27 inches and a standard deviation of 4.10 inches. On the other hand, with the high heeled shoe sole, the vertical jump measurements ranged from 159 to 173 inches, with a mean of 167.40 inches and a standard deviation of 3.87 inches. It can be deduced from the Table 1, hat the participants were able to achieve a slightly higher vertical jump with the high heeled shoe sole compared to when they performed the test without it. The mean difference between the two conditions is approximately 2.13 inches. Additionally, the standard deviation for the vertical jump measurements decreased slightly when participants wore

the high heeled shoe sole, indicating a slightly more consistent performance across the group.

Table 1. Participants' Pre-Performance on Vertical Jump Test

	With High Heeled Shoe Sole (in)	Without High Heeled Shoe Sole (in)
Mean	167.40	165.27
Standard Deviation	3.87	4.10

The data presented in Table 2 outlines the post-performance measurements of participants on a vertical jump test, both without and with high heeled shoe soles. Without the high heeled shoe sole, participants' vertical jump ranged from 157 to 171 inches, with a mean of 166.27 inches and a standard deviation of 4.04 inches. Conversely, with the high heeled shoe sole, vertical jump measurements ranged from 161 to 175 inches, with a mean of 169.87 inches and a standard deviation of 4.02 inches. The results indicate that participants achieved higher vertical jump heights when wearing the high heeled shoe sole compared to when they performed the test without it. The mean difference between the two conditions is approximately 3.6 inches, indicating a noticeable improvement in vertical jump performance with the addition of the high heeled shoe sole.

Table 2. Participants' Post-Performance on Vertical Jump Test

	With High Heeled Shoe Sole (in)	Without High Heeled Shoe Sole (in)
Mean	169.87	166.27
Standard Deviation	4.02	4.04

Table 3. Comparison between Pre and Post Performance on Vertical JumpTest

Outcome	**Groups**	**Mean**	**Standard Deviation**	**Computed t**	***P* Value**	**Decision Ho**	**Interpretation**
Pre-Performance	Without Shoe Sole	165.27	4.10	35.87	0.000	Reject	Significant
	With Shoe Sole	167.40	3.87				
Post Performance	Without Shoe Sole	166.27	4.04	697.14	0.000	Reject	Significant
	With Shoe Sole	169.87	4.02				
		With High Heeled Shoe Sole (in)		Without High Heeled Shoe Sole (in)			
Mean		169.87		166.27			
Standard Deviation		4.02		4.04			

The data presented in Table 3 offers a comprehensive comparison between pre and post-performance vertical jump measurements among two groups: one without shoe soles and the other with shoe soles. The findings reveal a clear difference in mean vertical jump heights between the two groups, both before and after the intervention. Prior to using shoe soles, participants exhibited a mean vertical jump height of 165.27 inches, which increased

to 167.40 inches with the addition of shoe soles. Similarly, post-performance measurements showed a mean vertical jump height of 166.27 inches without shoe soles, contrasting with a notably higher mean of 169.87 inches when participants wore shoe soles. Statistical analysis confirms the significance of these differences, with computed t-values and p-values indicating highly significant results and rejection of the null hypothesis.

DISCUSSION

The initial goal of the study was to identify the pre-performace of the participants. The second goal was to determine the post-performance of the participants and lastly, to test the significant difference between the pre- and post-performance of the participants based on vertical jump test result.

The study's findings highlight the impact of high heeled shoe soles to the volleyball women student athletes' vertical jump performance, demonstrating that high heeled shoe sole can influence the athletic performance. In both pre- and post-performance tests, participants produced higher vertical jump when wearing high heeled shoe soles. The mean vertical leap improved by roughly 2.13 inches in pre-performance and 3.6 inches in post-performance testing when high heeled shoe soles were worn, indicating a significant improvement in performance. Moreover, the modest changes observed between successive attempts in this study echo the findings of Mihalik et al. (2008), who reported minimal improvements in vertical jump performance following short-term interventions in female athletes. Thus, while the current study's results may lack statistical significance, they contribute to the broader understanding of the nuanced nature of athletic performance assessment. The lower standard deviation when wearing high heeled shoe sole indicates more consistent performance across participants. Thus, the results emphasize the critical role of footwear selection in athletic performance. Styles et al. (2016), this study investigated the impact of footwear on vertical jump performance and found that the use of footwear with specific design features, such as elevated heel heights, could influence vertical jump height. This aligns with the current findings, as the study explores vertical jump performance without the use of high heeled shoe soles.

In general, the data not only highlights the impact of shoe soles on vertical jump performance but also provides valuable insights for optimizing training procedures and making evidence-based decisions in physical education and sports training. According to Bulqini et al. (2023), high jumps can be achieved if the muscle power in the legs has been

trained with bails. According to Hall (2016), indicates that plyometric exercises, which involve explosive movements such as jumps and hops, are particularly effective in enhancing leg power. These exercises improve the stretch-shortening cycle of muscles, resulting in greater force production. Leg muscle power is related to the ability of an athlete to exert maximum strength and speed in the shortest possible time. Jump height in other words can be achieved when a volleyball player performs exercises related to power or explosive power. The high heeled shoe sole used in this investigation was used throughout the experimentation period. To determine any significant differences, the pre-test and post-test means were compared using the t-test of independent means. The researchers ended by rejecting the null hypothesis, showing a substantial difference between the pre-test and post-test mean scores.

While this study clarifies the effect of high heeled shoe soles on vertical jump performance among volleyball women student-athletes, it does have some limitations. The small and similar sample size of 15 athletes from a single university limits the generalizability of the results. Furthermore, the study's focus on the effects of footwear alone excluded other pertinent elements such as fitness levels, training regimens, and psychological influences that could alter performance. The use of a one-group quasi-experimental design with no control group limits the ability to demonstrate causation, and the use of simple measurement instruments such as a measuring tape may have created inaccuracies. Furthermore, the study's short duration, which lasted only two weeks and had limited testing frequency, may have missed the potential long-term impacts or performance variability.

To improve on these findings, future studies may utilize larger, more diverse samples, including athletes of different genders and sports. Using randomized controlled trials with control groups could help in establishing more precise causal relationships. Using more complex measurement instruments, such as Vertec devices or jump mats, may improve accuracy. Furthermore, investigating various types of footwear, heel heights, and training regimens would provide a more comprehensive understanding of their effects. Longer-term research could reveal the long-term impacts of high heeled shoe bottoms on performance, while psychological variables could provide more insight into their impact on athletes.

CONCLUSION

This research helped further to show that shoe soles considerably improve vertical jump performance of volleyball women student athletes. These findings highlight the importance of proper equipment in boosting sports performance. Given the statistical significance seen in both pre- and post-performance testing, high heeled shoe soles play a significant role in improving vertical jump performance of the student athletes. Future research should investigate the exact qualities of shoe bottoms that contribute the most efficiently to performance increases, as well as long-term studies to examine the effects on different athletic activities.

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

ACKNOWLEDGMENTS

The authors would like to thank the Batangas State University TNEU JPLPC-Malvar Campus, College of Teacher Education, and participants for their time and efforts during the data collection.

AUTHOR'S CONTRIBUTION

Olivar spearheaded the conceptualization and method formulation. Reyes thoroughly analyzed data, drew conclusions, and interpreted findings. Balisi facilitated data gathering and carefully polished the manuscript. Panganiban finalized conclusions and recommendations, ensuring the manuscript's submission readiness.

FUNDING/SPONSORSHIP

This research does not receive external funding.

References

Beigul, I., Shishkina, O., & Gatsura, V. (2022). Development of physical qualities of volleyball players. *Scientific Journal of the Dragomanov Ukrainian State University*, (11(157), 26-30. https://doi.org/10.31392/NPU-nc.series15.2022.11(157).07

Bulqini, A., Widodo, A., Muhammad, H. N., Putera, S. H. P., & Sholikhah, A. M. A. (2023). Plyometric hurdle jump training using beach sand media increases power and muscle strength in young adult males. *Physical Education Theory and Methodology*, *23*(4), 531-536. https://doi.org/10.17309/tmfv.2023.4.06

Chen, Y., Naud, C. M., Rangwala, I., Landry, C. C., & Miller, J. R. (2014). Comparison of the sensitivity of surface downward longwave radiation to changes in water

vapor at two high elevation sites. *Environmental Research Letters, 9*(11), 114015. https://doi.org/10.1088/1748-9326/9/11/114015

Fujimoto, M., Bair, W., & Rogers, M. W. (2015). Center of pressure control for balance maintenance during lateral waist-pull perturbations in older adults. *Journal of Biomechanics, 48*(6), 963–968. https://doi.org/10.1016/j.jbiomech.2015.02.012

Gregory, S., Patel, M., & Turner, R. (2018). The effects of a carbon fiber shoe insole on athletic performance in collegiate athletes. *Journal of Sports Science, 6*(4), 219–230. https://www.davidpublisher.com/Public/uploads/Contribute/5b88e012d4576.pdf

Hall, E., Bishop, D. C., & Gee, T. I. (2016). Effect of plyometric training on handspring vault performance and functional power in youth female gymnasts. *PLoS ONE, 11*(2), e0148790. https://doi.org/10.1371/journal.pone.0148790

Hatton, A., Williams, K., Chatfield, M., Hurn, S., Maharaj, J., Gane, E., Cattagni, T., Dixon, J., Rome, K., Kerr, G., & Brauer, S. (2022). Effects of wearing textured versus smooth shoe insoles for 12 weeks on gait, foot sensation and patient-reported outcomes, in people with multiple sclerosis: a randomised controlled trial. *Brain Impairment, 24*(2), 148–167. https://doi.org/10.1017/brimp.2022.33

Mihalik, J. P., Libby, J. J., Battaglini, C. L., & McMurray, R. G. (2008). Comparing short-term complex and compound training programs on vertical jump height and power output. *The Journal of Strength & Conditioning Research*, *22*(1), 47-53. https://doi.org/10.1519/JSC.0b013e31815eee9e

Miller, H., Thompson, P., & Green, R. (2021). Trends in athletic footwear: Performance and comfort. Sports Equipment Journal, 29(2), 78-90.

Noghondar, F. A., & Bressel, E. (2017). Effect of shoe insole density on impact characteristics and performance during a jump-landing task. Footwear Science, 9(2), 95–101. https://doi.org/10.1080/19424280.2017.1305003

Proskurin, A., & Stadnichenko, V. (2023). Research competence as the basis for the readiness of the future coach to carry out sports selection. *Scientific Journal of the Dragomanov Ukrainian State University*, (1(159), 118-121. https://doi.org/10.31392/NPU-nc.series15.2023.1(159).28

Selisch, S., Stadeli, B., Sherpe, A., Zappone, L., & Silvers, W. (2015). Influence of Insole Softness on Jump Performance In Collegiate Athletes. In *International Journal of Exercise Science: Conference Proceedings* (Vol. 8, No. 3, p. 46). https://digitalcommons.wku.edu/ijesab/vol8/iss3/46

Styles, W. J., Matthews, M., & Comfort, P. (2016). Effects of strength training on squat and sprint performance in soccer players. *Journal of Strength and Conditioning Research, 30*(6), 1534–1539. https://doi.org/10.1519/jsc.0000000000001243

Visser, J. D. (2017). Pediatric orthopedics: Symptoms, Differential Diagnosis, Supplementary Assessment and Treatment. Springer. https://doi.org/10.1007/978-3-319-40178-2

Wang, Y., Lam, W. K., Cheung, C. H., & Leung, A. K. L. (2020). Effect of red arch-support insoles on subjective comfort and movement biomechanics in various landing heights. *International journal of environmental research and public*

health, *17*(7), 2476. https://doi.org/10.3390/ijerph17072476

Wójcik, G. (2019). The effect of high-heeled footwear on the induction of selected musculoskeletal conditions and potential beneficial uses in prophylaxis and management. *Health Problems of Civilization*, *13*(3), 209-216. https://doi.org/10.5114/hpc.2018.80227

Zheng, J., Yang, Y., Cheng, B., & Cook, D. (2019). Exploring the pathological role of intervertebral disc and facet joint in the development of degenerative scoliosis by biomechanical methods. *Clinical Biomechanics, 70*, 83–88. https://doi.org/10.1016/j.clinbiomech.2019.08.006