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Original Article

Level of Physical Activity among Working Females Wearing High Heels

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ABSTRACT

Background: Previous studies have indicated that wearing high-heeled shoes (HHS) may be associated with foot and low back pain and could potentially affect the physical activity levels of women. The impact of HHS on musculoskeletal discomfort, fatigue, and biomechanical alterations has been substantiated, albeit with varying conclusions regarding their influence on physical activity and health.

Objective: The objective of this study was to evaluate the level of physical activity among working females who regularly wear HHS and to determine any associations with musculoskeletal discomfort.

Methods: A descriptive cross-sectional study was conducted with 125 participants recruited from various malls in Lahore using non-probability convenience sampling. The inclusion criteria encompassed adult females aged between 19 to 44 years, wearing heels of varying types and heights for a minimum of six hours per day. Exclusion criteria included a history of ankle dislocation, foot surgery, orthopedic or neurological anomalies, systemic illness affecting physical activity, or flat feet. Physical activity levels were assessed using the International Physical Activity Questionnaire short-form (IPAQ-sf), and data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25.

Results: The average age of participants was 25.14 years with a standard deviation of 4.509. The mean physical activity level was 1615.33 METs with a standard deviation of 1065.15. The majority of participants (54.4%) displayed a moderate level of physical activity, while 29.6% were categorized with low and 16% with high levels of physical activity. No significant correlation was found between heel height and physical activity levels or musculoskeletal discomfort.

Conclusion: Working females wearing high heels predominantly exhibit moderate levels of physical activity. The lack of significant associations suggests that heel height does not directly correlate with reduced physical activity or increased musculoskeletal discomfort in this sample. These findings highlight the complexity of factors influencing physical activity and musculoskeletal health in the context of HHS use.

Keywords: High-Heeled Shoes, Physical Activity, Musculoskeletal Discomfort, Working Females, Cross-Sectional Study.

INTRODUCTION

The human foot, a dynamic anatomical component, is essential in facilitating movement and bearing the body's weight. It functions as the primary contact point with the ground, supporting bipedal activities (1,2). The foot's complex structure and functional attributes have made it a subject of interest in clinical and industrial research for many years (3). Physical activity, characterized by human motion that involves increased energy expenditure and improved physical fitness (4), is recognized by the World Health Organization as any bodily movement that requires energy expenditure from skeletal muscles (5). Research highlights the benefits of physical activity in enhancing cognitive function and reducing the prevalence of chronic diseases in adults. Regular physical activity contributes to overall health and serves as a preventative measure against morbidity and mortality in older adults (6,7).

High-heeled shoes (HHS), defined by their elevated heels compared to the toes, symbolize sexuality, gender, class, or status (8). With a prevalence of 37% to 69% among women regularly wearing HHS (9), research has shown that these shoes can negatively impact

the body's center of gravity and joint forces, increasing the risk of various health issues such as pain, and problems in the knee, hip, and spine (10). Despite their aesthetic appeal, high heels are linked to a higher likelihood of chronic musculoskeletal (MSK) problems (11). Biomechanical studies have revealed that high heels cause significant changes in the musculoskeletal system's movement (kinetic) and position (kinematic), affecting the entire body from the spine to the toes. These changes increase the risk of MSK disorders, including osteoarthritis, hallux valgus (HV), and general MSK discomfort (12). Epidemiological evidence firmly establishes a connection between high heel use and an increased risk of hallux valgus (HV), musculoskeletal pain, and injuries to the wearer (13).

Wearing HHS presents multiple risks, such as lower back discomfort and potential knee injuries due to twisting. The uneven weight distribution can lead to issues like pinched nerves, swollen joints, and Achilles tendonitis. Continuous use of heels can cause calf muscles and tendons to shorten, leading to stiffness, reduced range of motion, and an increased risk of strains, sprains, and lower body injuries (14). Furthermore, high heels alter walking dynamics, resulting in a slower pace, reduced step length, and shorter stance phase time, along with increased ankle and knee plantar flexion, anterior pelvic tilt, and trunk extension (15). High heels also impair the function of the muscle pump, potentially leading to venous hypertension in the lower limbs, causing symptoms like pain, fatigue, and leg heaviness, thereby affecting overall physical well-being (16).

As heel height increases, there is a corresponding forward and medial shift in both the mean center of gravity and pressure. The body responds to this shift by engaging the lower back muscles (erector spinae) or the abdominal wall muscles, akin to its reaction to external forces or loads on the skeletal structure (17). However, the presence of foot and low back pain has been noted in women who wear HHS. A sustained decrease in physical activity among these individuals may indicate an imbalance between the demands of their work and their overall capacity to meet those demands (18).

Despite the existing knowledge, there is a lack of exploration into the physical activity levels of working females who regularly wear high-heeled shoes. This study aims to address this gap by investigating the prolonged impact of high heel usage on the physical activity levels of women. Many are unaware of how different heel heights and types affect their bodies and daily activities. This research seeks to offer insights into this common occupational practice, assessing the level of physical activity among working females wearing high heel shoes.

MATERIAL AND METHODS

In this descriptive cross-sectional study, 125 female participants were recruited from various malls in Lahore, including AL Fatah, Emporium Mall, Packages Mall, Fortress Square, Mall of Lahore, Metro, and Carrefour, during June 2021 to January 2022. The recruitment was based on non-probability convenience sampling, and the study received approval from the ethical board of Lahore College of Physical Therapy. The sample size was determined using the Census method (19).

Participants, aged between 19 to 44 years, who wore different types of heels such as Block heels, Mule heels, Kitten heels, and Wedge heels, with heights ranging from 2 to 4 inches for at least 6 hours a day, were included. However, those with a recent history of ankle dislocation or sprain, foot-related surgeries, orthopedic or neurological anomalies in the lower extremity, any systemic illness affecting physical activity, and those with flat feet were excluded.

The participants completed the International Physical Activity Questionnaire short-form (IPAQ-sf) to assess their level of physical activity. This measure was chosen for its demonstrated reliability ($r=0.82$, $P<0.05$) and its Intraclass Correlation Coefficient (ICC) value of 0.707 (20,21). The IPAQ-sf comprises seven questions that quantify average daily time spent walking, engaging in moderate-to-vigorous physical activity, and sitting, based on the previous week. This questionnaire facilitates the calculation of energy expenditure in metabolic equivalents (METs). The IPAQ-sf continuous score, expressed in METs-min/week, is calculated as "MET level x minutes of activity per day x days per week," with specific MET values assigned for walking (3.3 METs), moderate (4 METs), and vigorous physical activity (8 METs). Based on the IPAQ-sf category score, physical activity levels are categorized as "low," "moderate," or "high" (22-24).

Data collection involved ensuring the anonymity of the participants and safeguarding the confidentiality of the provided information. The data was subsequently entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 25. To present the findings, frequency tables, pie charts, and bar charts were employed. This methodology facilitated a comprehensive analysis of the impact of high-heeled shoe usage on the physical activity levels of working females.

RESULTS

The study comprised 125 female participants ranging in age from 18 to 34 years, with an average age of approximately 25 years. The distribution of ages had a standard deviation of 4.509, indicating a moderate spread of participant ages within the sample.

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Regarding the anthropometric data, the participants' heights varied from a minimum of 4.7 inches to a maximum of 5.5 inches, with an average height of around 5.17 inches. The variation in height was relatively small, as reflected by the standard deviation of 0.176. The weight of participants spanned from 44 kg to 61 kg, with an average weight of approximately 51.64 kg. The standard deviation for weight was slightly larger at 4.53, showing a wider range of body weights in the sample. The Body Mass Index (BMI), a measure of body fat based on height and weight, ranged from 18.41% to 27.77%, with an average BMI of 23.09%. The standard deviation for BMI was 4.68, suggesting a diverse body composition profile among the participants.

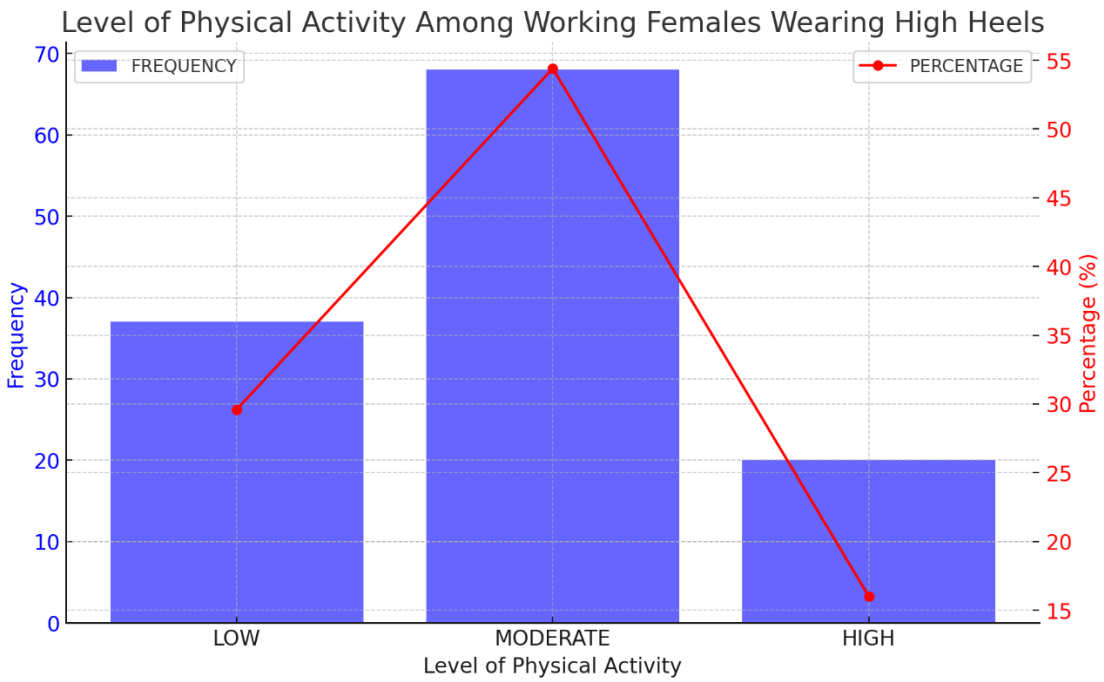

Figure 1 Level of Physical Activity among Working Females Wearing Heels

Physical activity levels, as measured in Metabolic Equivalents (METs), revealed a minimum recorded activity level of 345 METs and a maximum of 4158 METs among the participants, with a mean physical activity level of 1615.33 METs. The standard deviation for the physical activity level was quite high at 1065.15, indicating a significant variation in the physical activity levels among the individuals in the study.

Table 1 Descriptive Statistics of Participants' Age

No. of Participants	Minimum Age	Maximum Age	Mean Age	Standard Deviation
125	18 years	34 years	25.14 years	4.509

Table 2 Anthropometric Characteristics of Participants

Characteristics	Minimum	Maximum	Mean	Standard Deviation
Height (inches)	4.7	5.5	5.17	0.176
Weight (kg)	44	61	51.64	4.53
BMI (%)	18.41	27.77	23.09	4.68

Table 3 Descriptive Statistics of Participants' Physical Activity Level

No. of Participants	Minimum METs	Maximum METs	Mean METs	Standard Deviation
125	345	4158	1615.33	1065.15

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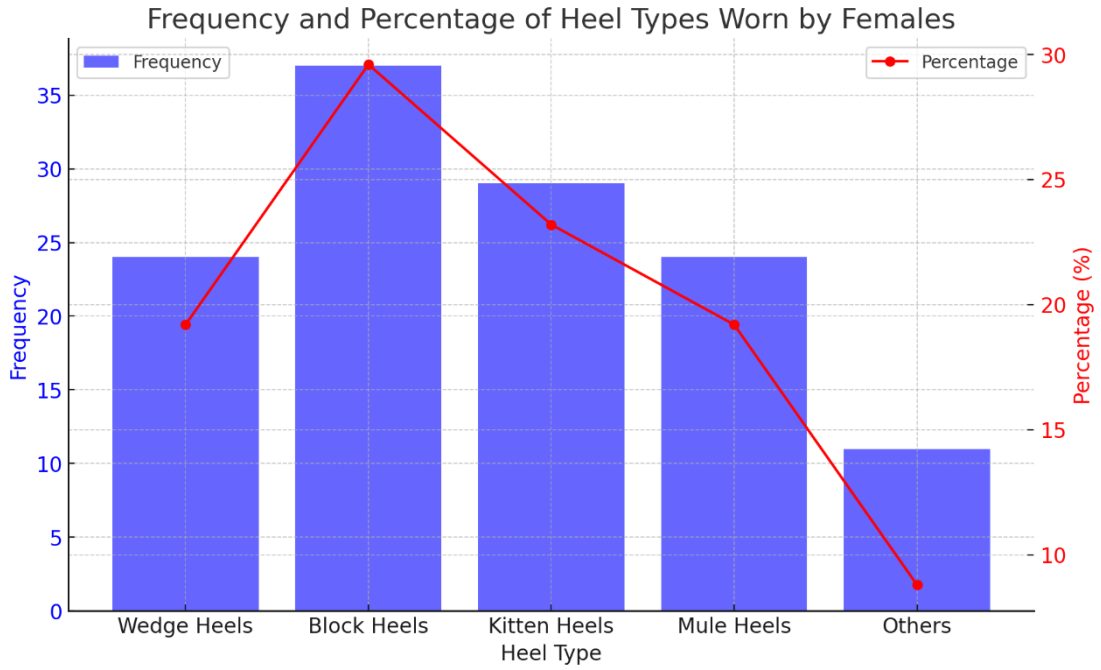

Figure 2 Heel Type

In terms of heel types worn, the data depicted in the graphs showed a distribution of preferences among wedge, block, kitten, mule heels, and other unspecified types. The most frequently worn heels were block heels, followed by mule and wedge heels, with kitten heels and others being less common. The percentages corresponded to these frequencies, with block heels being worn by approximately 29.6% of the participants, indicating a strong preference within the sample.

The level of physical activity among these working females wearing high heels was also charted, showing that a majority of the participants, about 54.4%, had a moderate level of physical activity. A significant portion, 29.6%, had a low level of physical activity, and a smaller group, 16%, engaged in a high level of physical activity. These proportions were visually represented in a bar and line chart, facilitating an understanding of the overall physical activity trends within the sample, which could be correlated with the type and usage of high heels.

DISCUSSION

The research conducted by Havva Gül Güren et al. in 2020 provided initial insights into the impact of high-heeled shoes on women's health, revealing that wearing such footwear is associated with foot and low back pain both at rest and during movement, with a notable correlation between Body Mass Index (BMI) and resting foot pain, although it found no significant relationship between physical activity levels and pain intensity (25). Contrasting these findings, the present study observed a moderate level of physical activity among working females, with no discernible association between physical activity levels and heel height.

Sunarsieh et al.'s study in 2023 further expanded on the subject by exploring the fatigue experienced by sales promotion girls wearing high heels. Their findings indicated that high heels could potentially induce work fatigue due to increased rigidity in the lumbo-pelvic area and altered joint kinetics, an effect exacerbated by prolonged use (26). This suggests a negative impact on musculoskeletal health, which contrasts with the current study's lack of association between fatigue and heel height.

In 2020, Malick W H et al. explored the relationship between musculoskeletal discomfort and the wearing of high heels, uncovering a positive correlation between the duration of wearing such shoes and discomfort in the shoulders and upper back (27). These findings align with the present study's observation of a mean physical activity level of 1615.33 METs, albeit without establishing a direct link to musculoskeletal discomfort.

The study by Afzal et al. in 2017 underscored the influence of high heels on the lumbar curve and associated back pain, gait alterations, and decreased physical performance levels during job-related activities (28). This highlights the potential long-term effects of high heel usage on posture and physical capabilities.

A systematic review and meta-analysis by Ziwei Zeng et al. in 2023 compiled evidence from 81 studies to assess the biomechanical and functional changes while wearing high heels versus flat shoes. The analysis concluded that high heels significantly alter ankle posture, balance, gait kinematics, and foot stability, corroborating the notion that high heel usage demands increased effort during walking and can induce joint pain and postural changes (29).

The current study, while contributing to the existing body of literature, has its limitations. It did not investigate the effects of varying heel heights on joint mechanics, which could have provided deeper insights into the specific effects of different heel types. The geographical scope, limited to specific malls in Lahore, may not reflect the broader spectrum of physical activity contexts among

working women, thus limiting the generalizability of the findings. Moreover, the exclusion of individuals with a history of injury or congenital abnormalities from the study may have resulted in a lack of data on how such conditions might influence the physical activity levels in this demographic.

For future research, it is vital to engage in studies with larger and more diverse populations, employing more robust methodologies and standardized measures. Comparative analyses with populations wearing various shoe types and expanding the geographical scope of data collection would enhance the external validity of such research. Inclusion of variables such as age, occupation, and health status would offer a more comprehensive understanding of the factors influencing physical activity levels. The present study revealed a predominance of moderate physical activity levels among working women who wear high heels. These findings, while informative, highlight the necessity for a broader investigation into the factors that influence physical activity in this group to better understand and promote their health and well-being.

CONCLUSION

The study concludes that while a moderate level of physical activity is prevalent among working females wearing high heels, there is no significant correlation between heel height and physical activity levels or musculoskeletal discomfort. These findings suggest that while high heels may not directly diminish physical activity, they do not contribute to musculoskeletal health, reinforcing the need for ergonomic considerations in women's footwear. The implications of this research advocate for a deeper investigation into the long-term effects of high heel usage on women's health, and for occupational health guidelines to potentially include recommendations on footwear to mitigate any adverse effects associated with prolonged use of high heels in the workplace.

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