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THE RELATIONSHIP BETWEEN HIGH HEEL SIZE VARIATION AND LONG STANDING DURATION ON THE RISK OF PLANTAR FASCIITIS

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ABSTRACT
Plantar fasciitis is one of the most common musculoskeletal complaints, especially in working women who often wear high heels and stand for long periods of time, such as Sales Promotion Girl (SPG). Biomechanical stress due to unnatural foot position when wearing high heels and standing static for long periods of time can increase the risk of plantar fasciitis. This study aimed to determine the relationship between the variation in the size of high heels and the length of standing duration on the risk of plantar fasciitis in female Sales Promotion Girl (SPG) workers. A cross-sectional study was conducted in one of the shopping centers in Surabaya in June 2025 - September 2025. A total of 66 Sales Promotion Girls were selected by simple random sampling. The dependent variable is plantar fasciitis. Independent variables were variations in heel size, high heel, and length of standing. Data was collected using questionnaire that had been tested for validity and reliability. The data was analyzed by the Spearman Correlation Test. The results showed that 68.6% of respondents used ⩾5 cm heels and 57.1% stood >8 hours per day. Of all respondents, 51.4% experienced no pain, 32.9% mild pain, and 15.7% moderate pain. Spearman's correlation analysis found a moderately positive association between high heel shoe height and standing duration with the risk of plantar fasciitis ($p<0.001$). The variation in the size of high heels and long standing duration had a significant relationship with the risk of plantar fasciitis, with a positive relationship, namely the higher the heel and the longer the duration of standing, the higher the risk of SPG women experiencing plantar fasciitis.

Keywords: high heels; plantar fasciitis; sales promotion girl; standing duration

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INTRODUCTION

Shoes have an important role, not only as a foot protector from various environmental conditions, but also as an appearance and aesthetic support. One type of shoe that is often associated with a feminine impression is high heels. The use of high heels is believed to give a more elegant, elegant impression, and increase confidence for the wearer (Febriani et al., 2021). Based on a study, high heels turned out to be the most popular choice of footwear among women. The results of a survey conducted in the United States show that around 59% of women are able to wear high heels for a period of one to eight hours every day, both for work, attending formal events, and daily activities (Irsyam et al., 2022).

Regular use of high heels can cause significant changes that are forced in the pressure distribution of the foot and lower extremities. If high heels are worn for a long period of time, this can have a negative impact on the anatomical structure and morphology of the foot. The most affected part is the front leg, which includes the metatarsal and pharyngeal bones, which will take on a greater load than usual. Women who are used to wearing high heels in their daily lives are at a higher risk of experiencing various health problems, such as musculoskeletal disorders in the legs, especially pain in the legs, as well as unnatural changes in walking patterns (Fatima et al., 2022). The risk of musculoskeletal complaints arising from muscle pain, excessive fatigue, and the potential for serious injury generally often occurs in the work environment, especially in jobs that require long

physical activity or non-ergonomic body positions. Based on a report from the Labour Force Survey published by the Health and Safety Executive (HSE), it was recorded that in the UK in 2016 there were around 507,000 workers with musculoskeletal disorders. Of these, most of the complaints experienced by these workers are related to problems with the lower extremities, such as the legs, legs, and knees (Amaliyah et al., 2020).

Employees who work while standing for more than six hours per day and wear high heels for long periods of time are at risk of discomfort, especially in the foot. The use of high heels with a height of more than five centimeters makes the position of the foot constantly in a tiptoed condition. This condition causes the calf muscles, particularly at the back of the heel, to be in tension due to continuous muscle contractions. As a result, muscle fibers experience increased tension and myofafacial tissue also experience mechanical stress for a long duration (Febriani et al., 2021). Existing research shows that walking in high heels requires different neural control than walking barefoot. The use of high heels changes the position and alignment of the body, thus affecting the center of gravity and negatively impacting gait biomechanics and postural stability. As a result, the balance of the body both when stationary and when moving becomes disturbed, which can ultimately increase the risk of falls in the wearer (Zeng et al., 2023)

The use of high heels is still carried out by women even though it can cause discomfort and increase the risk of injury, due to the obligations or rules of the work environment that require a certain appearance (Priatna et al., 2022). The use of high heels is often mandatory when working, even for a long period of time and even if the foot is not in a comfortable condition. Because the foot is the center of the weight base, the heel area and the sole of the foot are susceptible to various impaired movement functions.

Plantar fasciitis, also known as plantar fasciopathy, is an inflammation of the muscle tissue in the soles of the feet that causes pain. This condition is generally caused by excessive use of biomechanics, causing degenerative changes in the area of soft tissue attachment in the area of attachment of the plantar aponeurosis with the calkaneus bone (Trojian and Tucker, 2019). Plantar fasciitis is clinically characterized by the appearance of pain in the heel due to inflammation of the plantar fascia tissue. People with this condition generally complain of pain in the heels, especially when stepping for the first time in the morning or when starting to stand up after sitting for a long time (Effendi et al., 2022). This pain is generally caused by excessive pressure and stretching in the soft tissues of the plantar aponeurosis attachment area (Sekti and Prasetyo, 2021)

Plantar fasciitis is one of the most common causes of heel pain, and it is estimated that 1 in 10 people worldwide are at risk of developing this condition. A study conducted by North West Adelaide Health in Australia on 3,206 individuals aged 18 years and older showed that about 3.6% of participants experienced pain caused by plantar fasciitis (Priatna et al., 2022). The prevalence of plantar fasciitis cases in Indonesia is estimated to be in the range of 11 to 15%, with around one million patients visiting health care facilities every year. The majority of sufferers are women. The incidence throughout life reaches around 10%, and in one-third of cases, plantar fasciitis can occur in both legs (Agustina and Emawati, 2024). Aware of the influence of the use of high heels on the risk of plantar fasciitis, the researcher aimed to determine the relationship between the variation in the size of high heels and the length of standing duration on the risk of plantar fasciitis in female Sales Promotion Girl (SPG) workers.

METHOD

Research Design

A cross-sectional study was conducted in one of the shopping centers in Surabaya in June 2025 - September 2025. Data collection was carried out on independent and bound variables at one time

simultaneously with the aim of determining the relationship between the variation in heel size and the length of standing duration with the risk of plantar fasciitis.

Subject

The population in this study is Sales Promotion Girl (SPG) in one of the shopping centers in Surabaya. The sample in the study was a total of 66 Sales Promotion Girls selected by simple random sampling. Inclusion criteria include women who work as Sales Promotion Girls (SPGs), wear high heels with a height of < 5 cm or ≥ 5 cm for 6–8 hours or more than 8 hours per day, are willing to sign informed consent, and have a normal body mass index (BMI) (18.5–24.9). Respondents were excluded if they had a history of musculoskeletal disease or foot abnormalities, were experiencing acute leg injuries, had congenital abnormalities in the lower extremities, or had certain physical activity habits such as running on hard surfaces, walking barefoot, and long-duration running.

Instruments Research

Data collection in this study was carried out using a questionnaire distributed to Sales Promotion Girl (SPG) who works in one of the shopping centers in the city of Surabaya. The questionnaire is tested for validity and reliability. The results of the validity test for each item in each variable show a corrected item–total correlation value of ≥0.30. Meanwhile, the reliability test results for each variable indicate a Cronbach's alpha value of ≥0.70. The questionnaire consists of two parts, namely a questionnaire of respondents' personal data which includes age, phone number, weight, height, height of shoes, history of trauma, duration of standing per day, and length of use of shoes. The height of the heel of the shoe is classified into < 5 cm and ≥ 5 cm, while the duration of standing is divided into 6–8 hours and > 8 hours per day. The second part is in the form of the Foot Functional Index (FFI) which consists of 17 items with a score range of 0–10, which is divided into three subscales, namely pain (5 items), functional limitations (9 items), and difficulty with activities (3 items), where score analysis can be done separately on each subscale. The dependent variable is plantar fasciitis. Independent variables were variations in heel size, high heel, and length of standing. The research ethics permit was obtained from the Health Research Ethics Commission, Faculty of Medicine, Hang Tuah University Surabaya No. I/051/UHT. KEPK.03/VIII/2025.

Data Analysis

Data analysis includes univariate and bivariate analysis. Univariate analysis was used to describe the characteristics of respondents and questionnaire results in the form of frequency and percentage distributions. Bivariate analysis was performed to determine the relationship between the variation in heel size and the length of standing duration with the risk of plantar fasciitis using the Spearman Correlation Test, with a significance level of 0.05. The hypothesis is accepted if the p value < 0.05, which indicates a relationship between variables.

RESULT

Table 1.
Characteristics sample

Variable	f	%
Right Height (cm)		
<5cm	22	31,4
≥5cm	48	68,6
Long Standing Duration		
6-8 hours per day	30	42,9
>8 hours per day	40	57,1
Degree of Severity		
No Pain	36	51,4
Mild Pain	23	32,9
moderate pain	11	15,7
Severe Pain	0	0

Table 1, the majority of respondents used a shoe heel height of more than 5 cm (68.6%). In addition, most respondents had a standing duration of more than 8 hours per day (57.1%). On the severity of pain, the majority of respondents did not experience pain (51.4%).

Table 2.
Results of cross-tabulation of high heel size variation with the risk of plantar fasciitis

High Right		Risks of Plantar Fasciitis				
		No Pain	Mild Pain	moderate pain	Severe Pain	Total
<5cm	Frequency (people)	20	2	0	0	22
	Percentage (%)	28,6%	2,9%	0%	0%	31,4%
≥5cm	Frequency (people)	16	21	11	0	48
	Percentage (%)	22,9%	30%	15,7%	0%	68,6%
Total	Quantity	36	23	11	0	70
	Percentage (%)	51,4%	32,9%	15,7%	0%	100%

Table 2, the results of cross-tabulation between the variation in the size of the high heel heel and the risk of Plantaris Fasciitis. Where at the height of the heel of the shoe <5cm which had no pain, there were 20 people (28.6%) and 2 people with mild pain (2.9%). Meanwhile, with a high heel of ≥5cm, 21 people (30%) had mild pain, 11 people (15.7%) had moderate pain, and 16 people (22.9%) had no pain.

Table 3. Long-duration cross-tabulation results stand with a risk of plantar fasciitis

Long Standing Duration		Risks of Plantar Fasciitis				
		No Pain	Mild Pain	moderate pain	Severe Pain	Total
6-8 hours per day	Frequency (people)	24	6	0	0	30
	Percentage (%)	34,3%	8,6%	0%	0%	42,9%
>8 hours per day	Frequency (people)	12	17	11	0	40
	Percentage (%)	17,1%	24,3%	15,7%	0%	57,1%
Total	Quantity	36	23	11	0	70
	Percentage (%)	51,4%	32,9%	15,7%	0%	100%

Table 3 shows the results of cross-tabulation between the duration of standing and the risk of Plantaris Fasciitis. Where in the long duration of standing 6-8 hours per day, the majority had no painless results, there were 24 people (34.3%) and 6 people (8.6%) with mild pain. Meanwhile, with a long duration of standing > 8 hours per day, 17 people (24.3%) had mild pain categories, 11 people (15.7%) had moderate pain, and there were 12 people (17.1%) who had no pain.

Table 4.
Spearman Correlation Test of Variation in High Heel Size and Long Standing Duration with Risk of Plantar Fasciitis

Variable	Risks of Plantar Fasciitis	
	Correlation Coefficient (r)	p
High right	0.471	< 0.001
Duration	0.524	< 0.001

Table 4, it can be seen that the results of the Spearman correlation test show that there is a significant relationship between the variation in height heel size and the length of standing duration with the risk of plantar fasciitis. The variable of shoe heel height had a correlation coefficient value of r = 0.471 with a p value of < 0.001, which suggests a positive association with moderate strength between high heel shoe height and the risk of plantar fasciitis. This means that the higher the heel of the shoe used, the greater the risk of plantar fasciitis. Meanwhile, the long-standing duration variable showed a stronger correlation coefficient, namely r = 0.524 with a p value of < 0.001. This indicates a positive relationship with moderate to strong strength between the duration of standing and the risk of plantar fasciitis, where the longer the duration of standing, the higher the risk of plantar fasciitis experienced by the respondents. Overall, the two variables had a statistically significant relationship with the risk of plantar fasciitis, with long standing duration showing a stronger association than heel height.

DISCUSSION

The results of the study on the relationship between high heel size variation and long standing duration with the risk of plantaris fasciitis. The research conducted was included in the category of observational analytics, with the aim of determining the relationship between the variation in the size of the high heel and the length of time standing on the risk of plantar fasciitis. The risk of plantar fasciitis was measured using a Foot Functional Index questionnaire given to female respondents of sales promotion girl workers. Data collection was carried out with a cross-sectional study, taking a sample of 70 women who worked in one of the shopping centers in Surabaya.

Based on the research that has been carried out, data analysis and statistical tests in the form of the Spearman correlation test, the results of the analysis show significant results between the variation in high heel size and the risk of plantar fasciitis as evidenced by a p-value of <0.001 ($p < 0.05$) and a large correlation coefficient of 0.528. This means that there is a fairly strong relationship between the variation in the size of high heels and the risk of plantar fasciitis in female sales promotion girl workers. Where people who use shoes with heels more than ≥ 5 cm were found to have mild pain and 15.7% experienced moderate pain.

This is in line with research conducted by Umar et al. (2022) which shows that around 41.6% of respondents believe that the use of shoes with inappropriate fittings can increase the risk of occurrence Plantar fasciitis. This condition is characterized by the appearance of subacute and chronic pain in the lower part of the heel, precisely in the area between the medial plantar fascia and the medial calcaneal tubercle.

The results of this study are in line with the findings of Priatna et al. (2022), which shows a significant association between the use of high heels and the risk of plantar fasciitis. High heels have played a role in increasing the risk of plantar fasciitis, especially in women who work as sales promotion girls (SPG). High heels are known to increase pressure on the plantar fascia and change the way the foot moves, which can cause inflammation and pain in the heel area. Furthermore, Priatna explained that high heels put more pressure on the toe area. This directly increases the load on the plantar fascia, which is the connective tissue in the soles of the feet that is susceptible to inflammation.

Using high heels can change our posture and the way we walk naturally. These changes can cause stress on various parts of the body, such as the spine, hips, knees, ankles, and feet, including the plantar fascia. The design of high heels is usually less stable, so our feet have to work harder to maintain balance. As a result, the load on the plantar fascia increases, which can cause discomfort or even pain. So, while high heels can make a more attractive look, it's important to consider their impact on the health of your feet and the overall body (Insharah Bint e Ejaz et al., 2025).

The use of high heels with a height of more than 4 cm for a long time, which in the study used heels above 4.5 cm, can have negative effects on foot health. The use of high heels causes increased pressure on the medial side of the metatarsal bone, so that the area receives excess load. This condition can trigger pain, injury to the metatarsal bone, and even potentially cause deformity or deformation in the legs (Pradnyandari et al., 2022).

There was a significant relationship between the use of high heels and the incidence of Plantar fasciitis. The use of high heels can increase the risk of Plantar fasciitis up to 9.75 times compared to those who did not use high heels (Priatna et al., 2022). Women who wear high heels have an approximately 1.87 times greater risk of developing foot pain, especially in the heel area. This condition is caused by an increase in the plantar angle of flexion in the ankle during the wearing of high heels, which results in excess pressure on the front of the foot, both when standing and walking. When standing, the pressure distribution on the feet of the high-heeled shoe wearer

becomes uneven, with a significant increase in load from the heel to the front of the foot. The results also showed that the pressure on the front foot was much greater than the middle and back, which was about 4.5–4.8 times higher than the middle foot and 2.3–2.5 times greater than the back when wearing high heels (Yolanda et al., 2020).

The results of the analysis in this study also showed significant results between the length of standing and the risk of plantar fasciitis as evidenced by a p-value of <0.001 ($p < 0.05$) and a large correlation coefficient of 0.524. This means that there is a fairly strong relationship between the length of time standing and the risk of plantar fasciitis in female sales promotion girl workers. Where people who stand for 6-8 hours a day 8.6% experience mild pain, while for people who stand for more than 8 hours a day 24.3% experience mild pain and 15.7% experience moderate pain.

According to research Febriani et al., year 2021 The body is able to tolerate to remain in a standing position for about 20 minutes, while the use of high heels should be limited to a maximum of 3 hours. Wearing high heels that exceed this duration can cause various negative effects on the body, such as pain and tingling sensations due to excessive pressure on the foot. Standing for long periods of time can cause repeated pressure and strain on the plantar fascia, the tissue in the sole of the foot that connects the heel to the toe. The results of this study are in accordance with the research Khired et al. (2022) which shows that there is a relationship between the length of standing and walking and the occurrence Plantar fasciitis on workers. People who do this activity more than 6 hours a day tend to experience this problem more often.

Individuals who work as Sales Promotion Girl (SPG), which often has to stand or walk for long periods of time in high heels, is at high risk of trauma that can attack the plantar fascia, causing tissue damage and inflammation. This problem can get worse as the duration of their activities increases, as explained by (Rarassanti et al., 2022). When standing or walking in high heels, the risk of Plantar fasciitis increases because both activities put excess stress and abnormal pressure on the plantar fascia, which is the tissue that connects the heel to the toe. This can cause irritation, small tears, and eventually inflammation of the tissue. In addition, the constant use of high heels can lead to shortening of the calf muscles and Achilles tendon, which further exacerbates the pressure on the plantar fascia when we walk or stand. This increases the likelihood of it happening Plantar fasciitis (Majeed et al., 2023). So, it is important that they pay attention to the health of their feet and choose more comfortable footwear to prevent this problem.

Different results were obtained from the study Priatna et al. (2022) which shows the result of a long standing duration that is not significant with a standing duration of 8 and 12 hours. It is possible that other factors are more dominant in influencing the onset Plantar fasciitis, such as the height of the heels, the shape of the sole, the weight, and the shape of the arch of the foot. These factors can exert greater mechanical stress on the plantar fascia than just standing duration. Long standing duration is not always a direct cause plantar fasciitis. This condition is more influenced by a combination of factors such as the type of footwear, weight, and individual physical activity.

Wearing high heels for a long period of time can increase the risk of heel pain. This condition occurs because the position of the foot is forced to remain in a tip-toed state, thus putting excess pressure on the structure of the foot. When standing static for long periods of time, the plantar fascia and the muscles around the soles of the feet are forced to contract continuously. As a result, the weight of the body is more concentrated on the tips of the toes, specifically the thumbs, which puts additional pressure on the plantaris fascia. As it steps, this tissue will be attracted and affect the longitudinal arcus, causing repetitive tension and contraction that eventually leads to inflammation. In addition, the use of high heels with narrow and small heels increases mechanical stress on the myofascial tissue over a long period of time, thus increasing the risk of occurrence Plantar fasciitis (Sysbania et al., 2018).

Research Limitations

This study has a number of limitations, including data collection only carried out on Sales Promotion Girl (SPG) in one shopping center in Surabaya. In addition, researchers only focused on variations in heel size height and length of standing, without considering other factors such as activities outside of working hours that may also affect the occurrence of Plantaris Fasciitis.

CONCLUSION

This study concludes that the variation in the size of high heels and long standing duration had a significant relationship with the risk of plantar fasciitis, with a positive relationship, namely the higher the heel and the longer the duration of standing, the higher the risk of SPG women experiencing plantar fasciitis.

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