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The Impact of Petrissage on Functional Measures of High-Heeled Shoe Wearers

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Abstract

Background

Many women enjoy wearing high heels despite knowing they can harm their feet. Many uncomfortable conditions can originate from wearing this shoe, leading to biomechanical changes in ankle joints. Hence, the study is aimed to identify the effects of massage therapy in improving muscular flexibility among women wearing high heels.

Methodology

Forty female participants with chronic heel pain were included in the single-blinded randomized controlled trial. Participants were divided into Group-A (Stretching and deep heat) and Group-B (petrissage and deep heat). The treatment was performed for 4-weeks, 3 sessions/week in both groups. Foot function index and ankle dorsiflexion were recorded at baseline and after 4-weeks of intervention.

Results

Forty female participants with a mean age of 28.23±6.24 were recruited. Both groups showed significant improvement in all three variables, i.e. pain, disability, and ankle dorsiflexion. However, Group-B showed more significant results with mean differences of 1.80±2.22 and 4.1±6.7 ($p<0.05$) for pain and disability, respectively. A similar result was observed for ankle dorsiflexion in which a mean difference of 0.95±1.08 in the left and 1.25±1.12 in the right ankle was observed.

Conclusion

Both treatment programs are highly effective in reducing pain, reducing disability, and improving ankle joint ROM. However, petrissage massage and deep heating were superior compared to superficial heat with static stretching for females with chronic heel pain.

Keywords

Ankle joint, Disability, Massage, Pain, Range of motion.

Introduction

High heels can cause heel pain due to the alteration of the natural alignment of the foot and pressure on the heel. High heels can cause the calf muscles to shorten and the heel bone to be forced forward, leading to a condition called plantar fasciitis, which causes heel pain. High heels can also lead to other foot problems, such as blisters, calluses, and hammertoes. To prevent heel pain caused by high heels, it is recommended to choose shoes with a lower heel, a wider heel, and a padded sole and to wear them for shorter periods of time[1]. A recent survey shows that nearly three-quarters of all women wear high heels. Younger women are more likely to wear high heels daily; 49% of women aged 18 to 24, 42% of women aged 25 to 49, and 34% of women aged 50 and over wear heels every day[2]. The plantar flexors are a group of muscles in the lower leg responsible for pointing the toes away from the body. These muscles include the gastrocnemius, soleus, and tibialis posterior. These muscles play an essential role in maintaining proper posture and balance by helping to keep the body upright and stable. When the plantar flexors are tight, it can lead to an increased arch in the foot and cause the heel to lift off the ground when standing or walking, which can lead to an anterior pelvic tilt and result in a hunched-over posture. This can cause muscle imbalances in the leg and lower back, leading to pain and discomfort[3]. When the plantar flexors are tight, it can lead to an increased arch in the foot and cause the heel to lift off the ground when standing or walking, which can lead to an anterior pelvic tilt and result in a hunched-over posture. This can cause muscle imbalances in the leg and lower back, leading to pain and discomfort[4].

Wearing high heels can cause a condition called genu recurvatum, which is characterized by excessive backward bending of the knee. High heels alter the body's alignment, causing the knee to bend backwards, putting stress on the knee joint and surrounding muscles[5-7]. Wearing high heels can also cause a condition called metatarsalgia, which is characterized by pain and inflammation in the metatarsal bones of the foot. High heels put increased pressure on the front of the foot, specifically on the ball of the foot, and can cause the metatarsal bones to become stressed and painful[8-9]. The flexibility of the planter group of muscles plays a crucial role in preventing injury. The flexibility of a muscle is characterized by muscle length and full range of

motion of the joint. Physical wellness is only possible with good flexibility of the body[10- 11]. According to the American Orthopedic Foot and Ankle Society, heels greater than two inches in height are considered “high”, putting three to six times more pressure on the front of the foot than a shoe with a one-inch heel and potentially leading to bunions, heel pain, toe deformities, shortened Achilles tendon and back pain[11]. Kim et al. discovered that high-heel wearers have a 17-degree decrease in dorsiflexion and advised such women to engage in regular flexibility exercises[13].

Many therapeutic stretching techniques, such as static stretching, PNF stretching, and cyclic stretching, increase the range of motion by enhancing soft tissue extensibility. Clinicians routinely use various soft tissue mobilization techniques to address myofascial restrictions in muscle groups to decrease pain and restore range of motion. Despite a lack of evidence, massage is widely regarded as an effective modality for increasing flexibility[14]. Limited literature was available on the effects of massage on increasing flexibility. Massage has various effects, including biomechanical, physiological, reflexive, and psychological effects[15]. It provides the patient with confidence, encouragement, and psychological stimulation in order for them to use the part. Women have used heeled footwear for centuries, and now in the 21st century become an integral part of the wardrobe not only in the west but also in Pakistan. Recent research suggests that up to one-third of women suffer from permanent foot problems as a result of their prolonged wearing of heels. One in 10 women wears it at least 3 days a week. Heel pain develops from abnormal biomechanics, like females wearing high heels for a prolonged time. If untreated, it leads to secondary deformities and diseases, so it is crucial to find the best physical therapy technique to overcome this burden. The broad literature was searched locally but found a limited study related to petrissage massage over the calf muscle. This study was conducted to assess petrissage impact on high-heeled shoe wearers' functional measures.

Methodology

Research Design

A single-blinded randomized controlled design.

Study participants

Forty female participants working in organizations that demand prolonged standing and high-wearing heels, such as receptionists, models, and secretaries, were enrolled in the study. All subjects were assigned to two groups (n=20) in each group using the simple random sampling method.

Selection Criteria

All female participants who wear high heel footwear >2 inches at least 3 days a week, aged: between 18 and 40 years, have had bilateral heel pain for three months, and dorsiflexion active ROM <10° with knee extension were included in the study. Participants who were not willing to participate, with impaired sensation, orthopedic problems, or recent trauma, were excluded from the study.

Procedure

Participants with chronic heel pain were recruited for the study. The screening was done using a universal goniometer, measuring ankle dorsiflexion and knee extension. Based on the findings, participants were recruited into one of the treatment groups. After that, informed consent, both in English and Urdu, was provided, in which a detailed procedure was explained with its pros and cons. After informed consent, patients were divided equally (n=20) into Group-A, which was provided with stretching of calf muscles along with calf stretching, and Group-B, which received the petrissage (wringing) massage technique through the sealed envelope method of simple random sampling. The intervention was given for four weeks to each group, three sessions per week (12 sessions). Group-A received calf muscle (gastrocnemius and soleus) stretching, performed four times for each muscle with a hold of 15 seconds. The procedure was repeated for

both legs. In Group-B, patients were treated with petrissage over calf muscles. In this type of massage, calf muscles were kneaded and lifted to release tension and improve circulation. The technique involved using the fingers, thumbs, or knuckles to apply moderate pressure and make small, circular motions on the calf muscle for 10 minutes. The therapist used lifting and squeezing motions to work the muscle fibres in different directions to release any tension or knots for five minutes16 for each leg.

Heating was applied before treatment in both groups for 10 minutes. Foot function index and bilateral ankle range of motion were measured before and after 4-weeks of intervention by the researcher, who was not blind to the study group.

Data Analysis

The data was analyzed on medical software. Skewness and Kurtosis test was run to check the normality of data. Paired sample t-test was run to compare within-group analysis on pain, disability and range of motion. An independent t-test was applied to compare the post readings of both the groups on outcome measure while $p<0.05$ was considered statistically significant.

Results

A total of 40 participants were randomly allocated into Groups-A and B, having 20 patients in each group. The mean age of patients was around 28.23±6.24. Paired sample t-test was run for within-group analysis with a significant difference ($p<0.05$) noticed for both variables with a mean difference of 5.8±1.7 in Group-A and 8.95±3.42 in Group-B for pain, 8.15±2.3 in Group-A and 10.75±4.49 in Group-B respectively. The detailed description is shown in Table-1.

Table-1 Within-group analysis of pain and disability after 4-weeks of intervention

Variables	n	Group	Pre Mean±S.D	Post Mean±S.D	MD± S.D	95% CI	P-value
Pain	20	A	25.05±1.79	19.25±2.22	5.8±1.70	-6.61 to -4.98	0.0001
		B	27.30±3.64	18.3500±2.0	8.95±3.42	-10.55 to -7.34	0.0001
Disability	20	A	46.40±6.76	38.25±6.71	8.15±2.30	-9.22 to -7.07	0.0001
		B	47.7±6.85	36.95±6.70	10.75±4.49	-12.85 to -8.64	0.0001

n = Sample Size
SD = Standard Deviation
MD = Mean Difference
CI = Confidence Interval
P-value = Level of Significance

For between-group analysis, an independent t-test was applied in which a significant mean difference of 1.80±2.22 and 4.1±6.7 ($p<0.05$) was observed for pain and disability, respectively. The detailed description is shown in Table-2 and Figure-1.

Table-2 Between-group analysis of pain and disability after 4-weeks of intervention

Variables	n	Group	MD± S.D	95% CI	P-value
Pain	20	A	1.80±2.22	-3.26 to -0.33	0.00173
		B			
Disability	20	A	4.1±6.70	-8.46 to -0.16	0.0589
		B			

n = Sample Size
SD = Standard Deviation
MD = Mean Difference
CI = Confidence Interval
P-value = Level of Significance

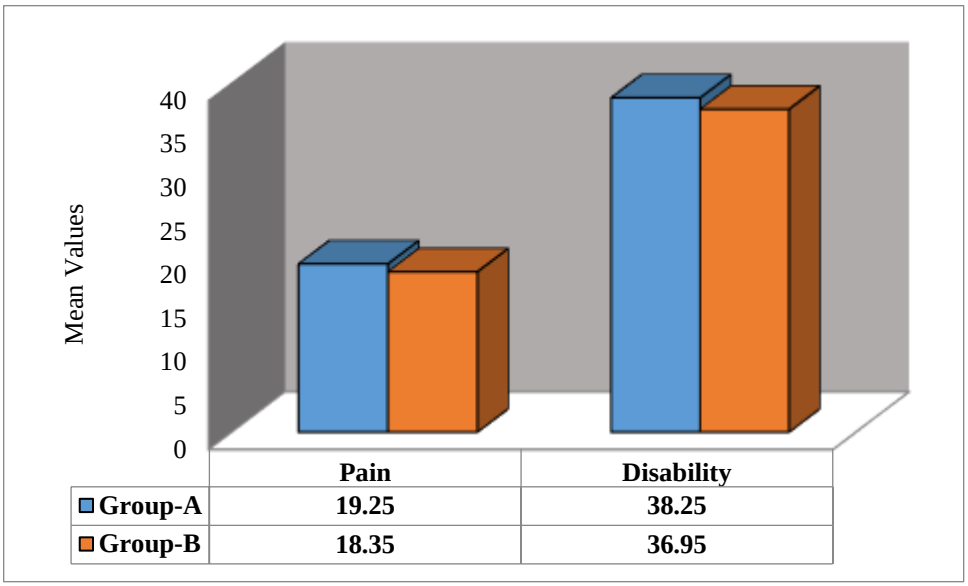

Figure-1 Between-group analysis of Pain and Disability

Bilateral ankle dorsiflexion was measured before and after 4-weeks of intervention. Paired sample t-test was run for within-group analysis with a significant difference ($p<0.05$) noticed for bilateral dorsiflexion. The detailed description is shown in Table-3.

Table-3 Within-group analysis of ROM after 4-weeks of intervention

Variables	n	Group	Pre Mean±S.D	Post Mean±S.D	MD± S.D	95% CI	P-value
Left ADF	20	A	8.55±1.14	13.0±1.02	4.45±1.05	3.95 to 4.94	0.0001
		B	8.25±1.25	13.95±1.14	5.7±1.49	5.0 to 6.39	0.0001
Right ADF	20	A	8.10±0.91	12.65±1.13	4.55±1.09	4.03 to 5.06	0.0001
		B	8.55±1.23	13.90±1.11	5.35±0.98	4.88 to 5.81	0.0001

ADF = Ankle Dorsiflexion
n = Sample Size
SD = Standard Deviation
MD = Mean Difference
CI = Confidence Interval
P-value = Level of Significance

For between-group analysis, an independent t-test was applied in which a significant mean difference of 0.95±1.08 and 1.25±1.12 ($p<0.05$) was observed for left and right ankle dorsiflexion, respectively. The detailed description is shown in Table-4 and Figure-2.

Table-4 Between-group analysis of ROM after 4-weeks of intervention

Variables	n	Group	MD± S.D	95% CI	P-value
Left AROM	20	A	0.95±1.08	0.25 to 1.64	0.0088
		B			
Right AROM	20	A	1.25±1.12	0.52 to 1.97	0.0012
		B			

AROM = Ankle Range of Motion
n = Sample Size
SD = Standard Deviation
MD = Mean Difference
CI = Confidence Interval
P-value = Level of Significance

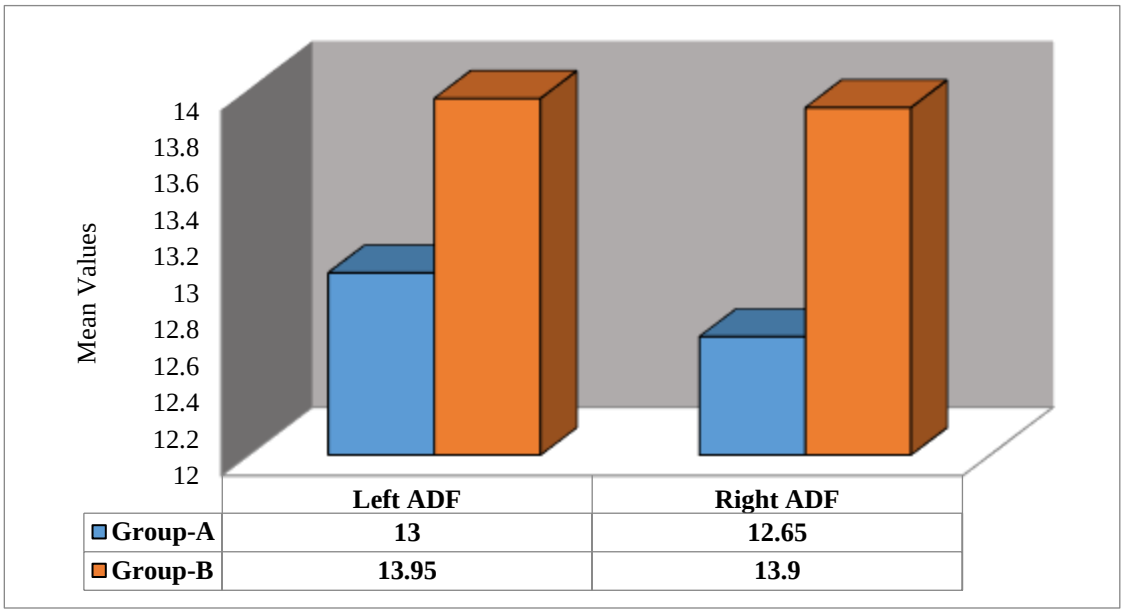

Figure-2 Between-group analysis of Ankle Dorsifelxion

Discussion

The results of our study revealed that both groups were equally effective in reducing heel pain, reducing disability and increasing ankle dorsiflexion within-group analysis. For between-group analysis, an independent t-test was applied in which significant mean difference of 1.80±2.22 and 4.1±6.7 ($p<0.05$) was observed for pain and disability respectively, indicating Group-B was slightly better in comparison to Group-A. Similar results were observed for ankle dorsiflexion which significant bilateral increase in the ranges in both groups however, between group analysis revealed more plantar flexor flexibility in Group-B as it showed much more significant improvement in ankle dorsiflexion range of motion with a mean difference of 0.95±1.08 in the left ankle and 1.25±1.12 in the right ankle. The findings were consistent with the findings of Sandeep et al. in 2015 that concluded in their study that a combination of both hot pack and petrissage massage is effective in improving plantar flexor flexibility in healthy young females[17]. A systemic review conducted in 2013 reported the result of thermal agents on ROM and soft tissue mechanical properties. A total of 1301 healthy participants in thirty-six studies satisfied the inclusion criterion and suggested that heat in conjunction with massage therapy had considerably altered the viscoelastic qualities of muscles and other collagenous tissues[18]. Despite interventions' impact on variables, our study had some limitations. The sample size was small, reducing the study results' generalizability. Hence more research with a greater sample size should be conducted for the generalizability of the effects of the intervention on outcome measures.

Conclusion

The study concluded that both treatment strategies were effective for patients with chronic heel pain for 4-weeks. However, a comparative analysis between the two therapies provided evidence in favor of the petrissage group. The findings were evaluated based on the foot function index and goniometer. However, to further consolidate the findings, more research with a large sample size must be performed to gather more robust findings.

Authors Contribution

Kayenat S: Conception and design.

Malik A: Drafting and data acquisition.

Gul B: Critical revision and final approval.

Declaration of Interest

None.

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None.

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