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<https://ejournal.upi.edu/index.php/penjas/article/view/36822>DOI: <https://doi.org/10.17509/jpjo.v6i2.36822>**Comparison between Ankle Stretching and Self Massage for Plantar Fascia Treatments on Male and Female Posture Balance****Jayadi*, Mohammad Furqon Hidayatulah, Noer Rachma**

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Article Info*Article History :**Received July 2021**Revised July 2021**Accepted August 2021**Available online September 2021**Keywords :**plantar fascia, posture balance, self massage, stretching ankle***Abstract**

When performing physical activity and sports, men and women are at risk of the plantar fascia that could decrease foot functions when walking, running, and jumping. Thus it requires accurate prediction results in handling it. This study aimed to determine whether clinical findings can help plantar fascia flexibility treatments and managements through ankle stretching and self-massage interventions on posture balance based on gender. This study used a quasi-experimental design with a 2x2 factorial design for male and female categories. The population of this study was 300 students, while the samples were 40 students aged 19-26 years, consisting of 20 males and 20 females. The sampling technique used stratified random sampling. Furthermore, the ankle dorsiflexion intervention was performed by stretching the ankle to overcome plantar stiffness. For self-massage, the golf ball roll relaxation gave a relaxing effect on plantar pressure. The ankle dorsiflexion and golf ball roll relaxation were performed for 45 seconds. The data collection instrument of this study was a standing stork test as a measurement reference. Data analysis used a two-way ANOVA statistical test with the help of the SPSS application. The results showed that the significance value of comparing ankle stretching and self-massage technique effects for plantar fascia on the posture balance based on gender was ($p > 0.05$). The significance value of posture balance in terms of gender was ($p = 0.417$). Meanwhile, the difference between ankle stretching and self-massage interaction based on gender was ($p = 0.000$). This study indicates that these findings can assist the treatment and management of plantar fascia flexibility through ankle stretching and self-massage interventions to balance the posture in terms of gender. Treatment for plantar fascia flexibility is more effective with ankle stretching.

INTRODUCTION

The problem of stiffness can occur in the movement of the surface of the foot affecting the physical quality of daily human life (Hendry, Linda Fenocchi, & Jim Woodburn, 2018). Stiffness is caused by the movement of the foot joints in the muscle contraction of the surface aponeurosis ligament tissue changing plantar fascia tension (Chun Long Liu, Ji Ping Zhou, Peng Tao Sun, Bai-Zhen Chen, Jun Zhang, 2020). The aponeurosis ligament network links several bone constituents in the mechanism of movement of the arch of the foot surface (Susanne Olesen Schaarup, Peder Burggaard, Finn Elkjær Johannsen, 2020).

The plantar fascia can occur in adults and athletic athletes using the foot; tearing the aponeurotic ligament causes pain, inflammation, and excessive movement when standing, walking, running, and jumping (Ferdinando Draghi, Salvatore Gitto, Gioia Ori Belometti, Chandra Bortolotto, 2017). In adults, an increase in body mass index is often found, which affects changes in the mechanical system of the foot surface tissue (Serkan Tasa & Cetin Alp, 2019). In addition, the use of shoes that are not suitable for the curvature of the foot surface affects the change in the shape of the ligament experiencing force in bending (Nicolas Kroupa, Baptiste Pierrat, Woo-Suck Han, & Florian Bergandi, 2020). The elasticity of the surface tissue of the foot is needed as a boost during running. The mechanism of movement through compression of the arch of the foot surface produces energy in the ability to move (Kirsty A. McDonald, Sarah M. Stearne, Jacqueline A. Alderson, Ian North & Neville. Pires, 2016). Plantar elastic stiffness can occur in runners. The results of research data prove modern runner injuries reach seventy percent per year (Irene S. Davis, & Hannah M. Rice, 2017). Athletes' lower extremity pain injuries are very high risk (Stephanie W. Mayer, Patrick W. Joyner, Louis C. Almekinders, 2014). However, plantar fascia problems are not only for athletic athletes but also for soccer players when they jump, feel pain and tenderness in the position of the feet touching the surface to hold the body's weight (Stephanie C. Pascoe & Timothy J. Mazzola., 2016).

Increased stiffness of the plantar fascia tissue is influenced by inflammation to pain which causes a lack of tissue flexibility due to problems with the movement mechanism system so that it affects posture stability

(Jerrold Petrofsky, Robert Donatelli, Michael Laymon, 2020). Research on foot health status questionnaires explained that in the age range of 18-64 years, 49% of men and 50% of women chronic plantar fascia foot pain in plantar fasciitis patients (Patricia Palomo-Lopez, Ricardo Becerro de Bengoa Vallejo, Marta Elena Losa-Iglesias, David Rodriguez-Sanz, & Cesar Calvo-Lobo, 2018). Plantar extremity problems are not only felt by the general public but are often experienced by athletes; for that, it is necessary to understand the knowledge of preventing and analyzing a movement ability that causes tension in the plantar fascia (Peter Fritz & Zoltan Szatmari, 2015) so that this condition interfere with the psychology of other body organs due to tension in the ligamentous tissue (Mahmut Cay, Cihat Ucar, Deniz Senol, Furkan Cevirgen, Davut Ozbag, Zuhail Altay, 2018). Furthermore, it can affect all systems in reducing the ability and endurance of the body (Pamela Ellgen, 2015).

Based on several complaints from the description of the problem above, it was explained about the causes and consequences of plantar fascia tissue tension from several points of view of physical activity, for that special treatment was needed to overcome it. In previous studies, ankle stretching increases the effect of posture balance on walking activities (Field, 2019). The stretch ankle is excellent for use in functional balance instability of the foot (Sun young ha, Jun ho han, 2018). Plantar massage can improve posture balance, mobility function, and flexibility in moving (Tutun Yumin, Eylem Simsek, Tulay Tarsuslu Sertel, Meral Ankaralı, 2017). Dorsiflexion ankle stretch can increase hip movement and affect posture changes when walking (Lee, 2018). Golf ball self-massage increases the heat under the plantar skin, causing a sense of relaxation affecting the elasticity of the tissue (Kshamas Shetty & Melini Roman Dsouza., 2018). Plantar massage can improve ankle balance and sensory and motor skills (Katherine L. Helly, Katherine A. Bain, Phillip A. Gribble, 2021). To increase plantar flexibility, use an ankle stretch through the gastrocsoleus muscle and a cross friction massage. Has the effect of increasing the Range Of Motion (Christopher Yelverton, Sunil Rama, 2019)

Based on the research results above, it can be concluded that stretching the ankle and massage has an effect on the plantar fascia, and this can improve posture balance. This statement contradicts the results of re-

search showing that stretching ankle and stroking massage only have a new problem effect on posture balance (Ladan Hemmati, Zahra Rojhani-Shirazi, 2016)

Furthermore, the use of plantar massage does not improve the performance of sprint and vertical jump athletes (Koya Mine, 2018). In some of the studies that have been mentioned, the research subjects were not reviewed in terms of gender. Therefore, this study aims to determine whether clinical findings can help treat and manage plantar fascia flexibility through stretching ankle and self-massage interventions on balance posture in terms of gender. These findings are expected to be used to find out which treatment is more suitable for improving posture balance in terms of the student's gender.

METHODS

This study uses a quasi-experimental design with a 2x2 factorial design. The instrument used is a standing stock test. The data analysis technique used Two Way Anova statistical analysis with the help of the statistical application of IMB SPSS version 23.0. Significant level ($p < 0.05$). In this study, two independent variables and dependent variables were used. The dependent variable in this study is the balance of posture, while the independent variables in this study are treatment and gender. The treatment in this study was divided into two types, namely, stretching ankle and self-massages. Gender in this study is divided into two, namely male and female.

Participants

The criteria for the subjects in this study were based on undergraduate students of physical education program study in even semesters, men and women aged 19-26 years, with the reason being active in the field of sports using planters for physical activity.

Sampling Procedures

The sampling technique in this study used stratified random sampling. Through this technique, the researchers divided the population into two age levels, namely 19-22 years and 23-26 years. A sampling at each level was carried out randomly by taking 20 male samples and 20 female samples so that a total sample of 40 students was obtained.

Materials and Apparatus

Before collecting instrument data standing stork test, the subject was given treatment for ankle stretching in the male and female sex standing position by performing an intervention to mobilize the stretching ankle joint dorsiflexion pressing the toe using a wooden block as a media tool with a height of 4 cm and a width of 25 cm for 45 seconds. Furthermore, self-massage tissue relaxation therapy through a golf ball roll with a base surface height of 2 cm, a length of 40 cm, in the middle a hole with a diameter of 4 cm in a horizontal direction along 30 cm to make it easier for the golf ball to roll for 45 seconds.

Procedure

The data collection instrument in this study used a standing stork test to determine the ability to maintain posture balance in a static position. Data collection using a standing stork test instrument to determine the ability to maintain a balanced posture in a static position (Kranti Panta, Watson Arulsinh, Joseph Oliver, Mukesh Sinha, 2015). Steps to use the standing stroke test are: standing relaxed on both feet, hands-on-hips, lifting one leg to touch above the knee on the pedestal, lifting the heel, and standing with toes as support (Mackenzie, 2005). Divide the subject into two groups at the time of measurement using each stopwatch in a continuous motion position—recording of time in the number of seconds.

Data Analysis

The research design used a 2x2 factorial to distinguish male and female sex categories in looking for differences in stretching ankle and self-massage on the plantar fascia in the balanced posture of the sexes using the standing stork test. Data collection uses the normality prerequisite test to determine the feasibility of the results of data analysis in the form of a normal distribution or not on the Kolmogorov - Smirnov test parametric statistics with a significance level of 0.05. Furthermore, this homogeneity test is used to determine whether it has the same variance to the sample population using the Levene method or the F test with a significant level of 0.05. In the statistical hypothesis test using two-way ANOVA at a significance level of 0.05.

RESULT

The following are the results of the average value analysis after taking the instrument in the study.

Table 1. Results of research data analysis

No	Treatment	Gender		SD	Marginal mean
		Male	Female		
1	Stretch ankle	17.44	16.94	6.22	17.19
2	Self massage	26.97	30.38	4.86	28.67
Marginal mean		22.21	23.66		

Table 2. Two-way ANOVA statistical test results

No	Source	Sum of squares	Df	Mean Square	F	Sig
1	Corrected model	1377,1	3	459	14,6	,000
2	Intercept	21044,6	1	21044,6	672	,000
3	Genderanv	21,1	1	21,1	,675	,417
4	Faktor	1317,7	1	1317,7	42,1	,000
5	Genderanv * Faktor	38,2	1	38,2	1,2	,276
6	Error	1126,6	36	31,2		
7	Total	23548,5	40			
8	Corrected Total	2503,8	40			

R. Squared = ,550 (Adjusted R Squared = ,513)

Male ankle stretch has an average of 17.44 higher than Female's 16.94. Furthermore, the average result for male self-massage is 26.97, which is lower than female self-massage of 30.38. stretching ankle for all genders showed an average result of 17.19, lower than self-massage of all genders of 28.67. Furthermore, data collection using the prerequisite test of normality and homogeneity to test the statistical hypothesis using two-way ANOVA. The results of the normality test used Kolmogorov – Smirnov, the ankle stretching results with a sig value of $0,103 \geq 0,05$, while the results of self-massage with a sig value of $0,200 \geq 0,05$, data showed normally distributed population. The results of the homogeneity using the Levene method showed a value table with the value of sig. $0.087 \geq 0.05$ so that the population has a homogeneous variance.

Based on the prerequisite test, the results of the two variables have data that are normally distributed and homogeneous. Thus, this condition fulfills the assumption to be continued in hypothesis testing using two-way ANOVA statistical analysis. From the results of hypothesis testing with Two-way ANOVA statistical analysis, the results of data analysis are shown in table 2.

Ankle stretching, stretching ankle, self-massage of the plantar fascia in the posture balance probability (p) 0.000 with a significant value of more than (p <0.05) stating that there is a difference in the treatment that occurs. Furthermore, the male and female gender categories have a probability (p) of 0.417 at a significant value (p<0.05) that there is no difference in treatment. Based on the adjusted R square, the result is 0.513, so it can be concluded that in this study, the independent variable has an effect of 51.3% on the dependent variable.

DISCUSSION

Based on the results of this study, it was stated that there were differences in the treatment of stretching ankle and self-massage on the plantar fascia on posture balance. The ankle stretch is excellent in instability as well as hip movement in functional balance. The Stretch ankle affects the flexibility of the gastrocnemius muscle to the plantar. This can be explained that the leg muscle tissue is very closely related to every movement activity that occurs in tension problems.

Furthermore, from the results of the study, there was no gender difference. The problem of plantar tissue stiffness can affect the physical quality of every human life. The plantar fascia can occur in adults and even athletes with plantar extremities. The causative factor is excessive movement when standing, walking, running, and jumping. In adults, there can be an increase in body mass index, which affects the plantar mechanism. In addition, the use of shoes that do not match the curve of the surface of the foot affects the changes in the shape of the ligaments. Therefore, it can be explained that the problems in the plantar fascia do not differentiate between genders; this can be experienced by everyone.

CONCLUSION

There is a difference between the stretching ankle and plantar fascia self-massage on the balance of male and female postures. However, there was no difference between male and female gender categories in the stretching ankle. And self-massage treatments. In addition, there are differences in stretching ankle and self-massage in their treatment. In this case, based on the relevant results in this study, it can be concluded that stretching ankle and self-massage can be used in the treatment of plantar fascia of all genders. The findings in this study explain that stretching ankle and self-massage provides relaxation of the plantar fascia tissue, which affects the balance of posture of all sexes.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

REFERENCES

- Christopher Yelverton, Sunil Rama, B. Z. (2019). Manual therapy interventions in the treatment of plantar fasciitis: A comparison of three approaches. *Health SA Gesondheid*, 24, 1–9. <https://doi.org/10.4102/hsag.v24i0.1244>
- Chun-Long Liu, Ji-Ping Zhou, Peng-Tao Sun, Bai-Zhen Chen, Jun Zhang, C.-Z. tang & Z.-J. Z. (2020). Influence of different knee and ankle ranges of motion on the elasticity of triceps surae muscles, Achilles tendon, and plantar fascia. *Scientific Reports*, 10(1), 1–10. <https://doi.org/10.1038/s41598-020-63730-0>
- Ferdinando Draghi, Salvatore Gitto, Gioia Ori Belometti, Chandra Bortolotto, A. G. D. & R. (2017). Imaging of plantar fascia disorders : findings on plain radiography , ultrasound and magnetic resonance imaging. *Insights into Imaging*, 69–78. <https://doi.org/10.1007/s13244-016-0533-2>
- Field, T. (2019). Pediatric Massage Therapy Research: A Narrative Review. *Children*, 6(6), 1–12. <http://www.mdpi.com/journal/children>
- Hendry, G. J., & , Linda Fenocchi, Jim Woodburn, & M. S. (2018). Foot pain and foot health in an educated population of adults: Results from the Glasgow Caledonian University Alumni Foot Health Survey. *Journal of Foot and Ankle Research*, 11(1), 1–15. <https://doi.org/10.1186/s13047-018-0290-1>
- Irene S. Davis , Hannah M. Rice, & S. C. W. (2017). Why forefoot striking in minimal shoes might positively change the course of running injuries. *Journal of Sport and Health Science*, 6(2), 154–161. <https://doi.org/10.1016/j.jshs.2017.03.013>
- Jerrold Petrofsky, Robert Donatelli, Michael Laymon, & H. L. (2020). Greater Postural Sway and Tremor during Balance Tasks in Patients with Plantar Fasciitis Compared to Age-Matched Controls. *Healthcare*, 8(4), 1–11. <https://doi.org/10.3390/healthcare8040510>
- Katherine L. Helly, Katherine A. Bain, Phillip A. Gribble, and M. C. H. (2021). The Effect of Plantar Massage on Static Postural Control in Patients with Chronic Ankle Instability: A Critically Appraised Topic. *Journal of Sport Rehabilitation*, 30(3), 507–511. <https://doi.org/10.1123/JSR.2020-0092>
- Kirsty A. McDonald, Sarah M. Stearne, Jacqueline A. Alderson, Ian North, Neville . Pires, J. R. (2016). The Role of Arch Compression and Metatarsophalangeal Joint Dynamics in Modulating Plantar Fascia Strain in Running. *PLoS ONE*, 11(4), 1–16. <https://doi.org/10.1371/journal.pone.0152602>
- Koya Mine, T. N. (2018). Is Pre-Performance Massage Effective To Improve Maximal Muscle Strength and Functional Performance? a Systematic Review. *International Journal of Sports Physical Therapy*, 13(5), 789–799. <https://doi.org/10.26603/ijsp20180789>
- Kranti Panta, Watson Arulsingh, Joseph Oliver, Mukesh Sinha, & M. R. (2015). Flamingo Test and the Stork Test in measuring static balance on healthy adults. *The Foot and Ankle Online Journal*, 8(3), 4. <https://doi.org/10.3827/faoj.2015.0803.0004>
- Kshamas Shetty & Melini Roman Dsouza. (2018). Effectiveness of Plantar Fascia Mobilization and Passive Stretching on Hamstring Muscle Flexibility. *International Journal of Health Sciences and Research*, 8(1), 134–137. https://www.ijhsr.org/IJHSR_Vol.8_Issue.1_Jan2018/IJHSR_Abstract.020.html
- Ladan Hemmati, Zahra Rojhani-Shirazi, & S. E. (2016). Effects of plantar flexor muscle static stretching alone and combined with massage on postural balance. *Ann Rehabil Med*, 40(5), 845–850. <https://doi.org/10.5535/arm.2016.40.5.845>
- Lee, K. (2018). Activation of pelvic floor muscle during ankle posture change on the basis of a three-dimensional motion analysis system. *Medical Science Monitor*, 24, 7223–7230. <https://doi.org/10.12659/MSM.912689>
- Mackenzie. (2005). *Performance Evaluation Tests 101*. Electric Word plc.
- Mahmut Cay, Cihat Ucar, Deniz Senol, Furkan Cevirgen, Davut Ozbag, Zuhail Altay, & S. Y. (2018). Effect of increase in cortisol level due to stress in healthy young individuals on dynamic and static balance scores. *North Clin Istanbul*, 5(4), 295–301. <https://doi.org/10.14744/nci.2017.42103>
- Nicolas Kroupa, Baptiste Pierrat, Woo-Suck Han, S. G., & , Florian Bergandi, & J. ome M. (2020). Bone Position and Ligament Deformations of the Foot From

- CT Images to Quantify the Influence of Footwear in ex vivo Feet. *Front Bioeng Biotechnol*, 8(June), 1–11. <https://doi.org/10.3389/fbioe.2020.00560>
- Pamela Ellgen. (2015). Psoas strength and flexibility : core workouts to increase mobility, reduce injuries and end back pain. Ulysses Press. <https://www.pdfdrive.com/psoas-strength-and-flexibility-core-workouts-to-increase-mobility-reduce-injuries-and-end-back-pain-e196748301.html>
- Patricia Palomo-Lopez, Ricardo Becerro-de-Bengoa-Vallejo, Marta Elena Losa-Iglesias, David Rodriguez-Sanz, Cesar Calvo-Lobo, & D. L.-L. (2018). Impact of plantar fasciitis on the quality of life of male and female patients according to the Foot Health Status Questionnaire. *Journal of Pain Research*, 875–880. <https://doi.org/10.2147/JPR.S159918>
- Peter Fritz & Zoltan Szatmari. (2015). Getting Back To Exercise Without Pain: The Ankle part. *Recreation*, 19–23. <https://doi.org/10.21486/recreation.2016.6.4.3>
- Serkan Tasa &, & Cetin Alp. (2019). An investigation of the relationship between plantar pressure distribution and the morphologic and mechanic properties of the intrinsic foot muscles and plantar fascia. 72 (March), 217–221. <https://doi.org/10.1016/j.gaitpost.2019.06.021>
- Stephanie C. Pascoe & Timothy J. Mazzola. (2016). Acute medial plantar fascia tear. *journal of orthopaedic & sports physical therapy*, 46(6), 495. <https://doi.org/10.2519/jospt.2016.0409>
- Stephanie W. Mayer, Patrick W. Joyner, Louis C. Almekinders, & S. G. P. (2014). Stress Fractures of the Foot and Ankle in Athletes. *Sports Health*, 6(6), 481–491. <https://doi.org/10.1177/1941738113486588>
- Sun young ha, Jun ho han, Y. hee sung. (2018). Effects of ankle strengthening exercise program on an unstable supporting surface on proprioception and balance in adults with functional ankle instability. *Journal of Exercise Rehabilitation*, 14(2), 301–305. <https://doi.org/10.12965/jer.1836082.041>
- Susanne Olesen Schaarup, Peder Burgaard, Finn Elkjær Johannsen. (2020). The Journal of Foot & Ankle Surgery Surgical Repair of Complete Plantar Fascia Ruptures in High-Demand Power Athletes : An Alternative Treatment Option. *The Journal of Foot and Ankle Surgery*, 59(1), 195–200. <https://doi.org/10.1053/j.jfas.2019.07.018>
- Tutun Yumin, Eylem Simsek, Tulay Tarsuslu Sertel, Meral Ankaralı, H. Y. & M. (2017). The effect of foot plantar massage on balance and functional reach in patients with type II diabetes. *Physiotherapy Theory and Practice*, 33(2), 115–123. <https://doi.org/10.1080/09593985.2016.1271849>