

Effectiveness of Reflexology for Premenstrual Syndrome (PMS) and Other Health Difficulties Specific to Women

Ayame Inoue¹, Yukie Majima², Seiko Masuda² and Takeshi Matsuda³

¹Graduate School of Humanities and Sustainable System Sciences, Osaka Prefecture University, Sakai, Osaka, Japan

²Graduate School of Informatics, Osaka Metropolitan University, Sakai, Osaka, Japan

³Graduate School of Management and Information Technology, Hannan University, Matsubara, Osaka, Japan

Keywords: Bowel Sounds, PMS Symptoms, Reflexology.

Abstract: Reflexology is said to be effective for regulating physical discomfort and relieving pain, but it is also expected to be effective for improving PMS symptoms, which are common among many women. However, few researchers have examined its effects for PMS symptoms, so few women use reflexology and most of them still rely on drugs such as oral contraceptives and chemical therapies. For this study, we examined reflexology effects on PMS symptoms and the body, devoting particular attention to bowel sounds. This paper presents results of experiments which treat reflexology for three women who have each PMS symptoms and other health difficulties. As results of bowel sounds, frequency spectrums of three women have been consolidated into a single curve. one after treatment. In the future, we increase the number of data and clarify the relation among reflexology, bowel sounds, PMS symptoms and other health difficulties.

1 INTRODUCTION

Many women in Japan have premenstrual syndrome (PMS) symptoms such as constipation, diarrhea, and abdominal pain. A survey conducted by the Japan Society of Obstetrics and Gynecology in 2018 found that 70–80% of menstruating women have PMS symptoms, and that about 5.4% of them have difficulties in daily life (The Japan Society of Obstetrics and Gynecology, 2018). The annual economic loss attributable to medical expenditures and lost productivity of women working with gynecological disorders, including PMS symptoms, is calculated as at least 6.37 trillion yen. To resolve these difficulties and losses, femtec-related services (femtec: The coined word of female and technology. Items and services that solve health problems of women (Hitachi Consulting, 2021).) and products have been increasing in recent years, but many people still rely on drugs such as oral contraceptives and chemical therapies.

Reflexology, a non-chemical therapy, is aimed at producing health without reliance on chemicals. It was introduced into medical treatment as a complementary therapy in Europe the United States. The soles of the feet have reflex points corresponding

to internal organs throughout the body, which are stimulated by pressing them with fingers or sticks to activate the internal organs, thereby improving metabolism and immunity (Embong, 2015). Studies examining the effects of reflexology include one which found effectiveness for lowering blood pressure and heart rate in stage 2 hypertensive patients (Kotruchin, 2021). One study found that the procedure had beneficial effects of improving hair and skin-related dysfunction in people with type 2 diabetes (Magalhães da Silva, 2015). Furthermore, a study of primiparous women indicated that treatments reduced anxiety and the duration of labor, and increased Apgar scores (Moghimi-Hanjani, 2015). Other studies have shown changes in the frequency of defecation among female university students. Although the results were not significant, reflexology effects were suggested (Nakahashi, 2011).

Results of these studies imply that reflexology is effective for improving PMS symptoms, but few researchers have examined its effects for PMS symptoms. Those few reported studies have been qualitative, short-term evaluations.

For this study, we examined the long-term effects of reflexology quantitatively by continuously obtaining physical data such as bowel sounds and blood pressure. As an introduction to the study, this

paper presents a comparison of data indicating reflexology effects on women's bodies before and after a single treatment.

2 EXPERIMENT TECHNIQUES

2.1 Experiment Summary

For this experiment, three women in their 20s to 40s affected by constipation and menstrual pain underwent reflexology treatment for 20 min per leg, for a total of 40 min.

Prior to conducting this experiment, we have been approved by the University's Ethics Committee.

2.2 Participants

The participants with consent were three women with PMS symptoms and difficulties such as uterine fibroids: one was in her 20s; one was in her 30s; and one was in her 40s. The participants' health difficulties and self-care status are shown with interview data.

2.3 Experiment Flow and Acquired Data

The experiment flow and data acquired from this experiment are described below. This experiment included the following steps: 1. preliminary survey; 2. body data acquisition – 1; 3. reflexology treatment; and 4. body data acquisition – 2. For participants scheduled to receive multiple treatments, the pre-survey content after the second treatment changed to inquiries about continued effects of reflexology.

1. Preliminary Survey

Questions about defecation and menstruation were asked, with contents mainly as follows.

(Contents of the first survey)

- Diarrhea, constipation, and abdominal pain
- Days since last menstrual period
- Menstrual cycle
- PMS symptoms other than defecation
- Self-care for symptom relief
- Other concerns about body condition

(Details of the second and subsequent surveys)

• Bowel difficulties and PMS symptoms improved by reflexology

• Other difficulties improved by reflexology other than those described above.

2. Acquisition of Physical Data (1)

We obtained the following data.

- Blood pressure
- Heart rate
- Blood oxygen level

Table 1: Data acquisition equipment.

Item	Equipment name
Bowel sound	JPES-01 (Mitorika Co., Ltd.)
Blood pressure	UA-651BLE (A&D Co. Ltd.)
Heart rate	//
Blood oxygen level	Onyx Model 9500 (Star Product Inc.)

3. Reflexology Treatment

Participants were treated by a practitioner who had attended a reflexology course for at least one year and who held a private certification. The left leg was treated for 20 min, followed by the right leg for 20 min, for a total of 40 min. The practitioner applied treatment using the hands and sticks, when necessary, using a cream. Both the participant and the practitioner sit on a chair during the treatment.



Figure 1: Experimental environment.

4. Body Data Acquisition (2)

We obtained the data obtained in step 2 again.

3 RESULTS OF EXPERIMENTS

The following describes results obtained from data acquired during the experiment. For this experiment, data of the first group were obtained after the participant sat in a chair for 5 min of rest. Data of the second group were obtained immediately after the treatment of both legs, but the participant remained seated.

3.1 Bowel Sound Data

The electronic stethoscope used for this experiment, JPES-01, can acquire information related to frequency and decibels. To date, the state of the

intestines has been determined fundamentally by the number of times per minute that the intestines move, called intestinal peristalsis. For this study, we analyzed bowel sounds not only by sound counts but also by frequency, decibels, and changes in time-series data.

3.1.1 Before Treatment

1. Frequency Data

The following graph shows approximately one minute of bowel sound data obtained before the procedure. The vertical axis shows decibels. The horizontal axis shows the frequency in hertz. This graph shows how much of which frequency sine wave is contained in the sound wave for one minute.

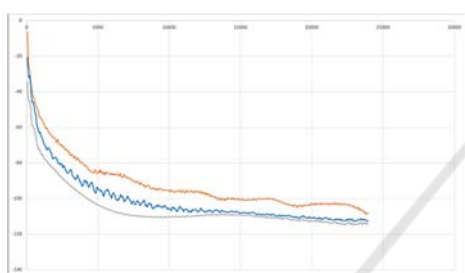


Figure 2: Frequency spectrum of three participants (before treatment).

The curves are similar for all three participants, but the concavo-convexity shapes differ. Also, the frequency bands that contain many sine waves differ.

2. Waveform data

As with the frequency data, one minute of data obtained before the procedure are shown below. This graph shows the amplitude of the intestinal acoustic waveform on the vertical axis and time on the horizontal axis. Data for one participant are shown here.

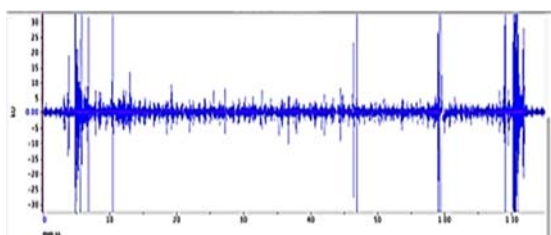


Figure 3: Time series waveform data (before treatment).

3.1.2 After Treatment

1. Frequency Data

The data for approximately 1 min are shown below, as they were before the treatment.

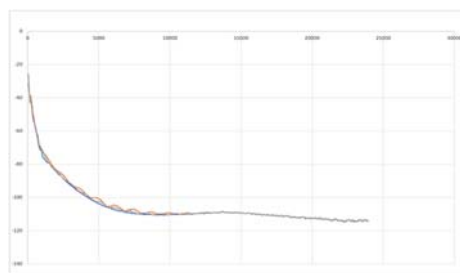


Figure 4: Frequency spectrum of three participants (after treatment).

The data here show that the curves of the three participants have been consolidated into a single curve. Two of them seem to have less unevenness in their curves, although one of them does not change much.

2. Waveform Data

The waveform data of about 1 min are shown here as they were before the treatment. The amplitude was smaller than before the treatment. The amplitudes of the other two participants also decreased or remained almost identical.

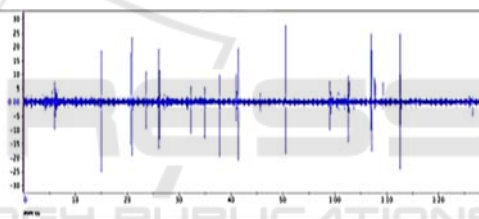


Figure 5: Time series waveform data (after treatment).

3.2 Blood Pressure, Heart Rate, Blood Oxygen Levelssure

This section presents a description of data other than bowel sounds obtained before and after reflexology.

3.2.1 Blood Pressure

A comparison of blood pressure before and after treatment showed an average of 106.8 (131.0/82.7) before the treatment and 104.1 (126.3/82) after treatment. Although an earlier study showed that blood pressure had decreased, the present results differed from those of an earlier study (Machi, 2000) in that the three participants respectively showed a decrease, maintenance, and increase in blood pressure. Some participants reported that they felt sleepy during the treatment, which implies a relaxing effect. Reflexology reportedly improves blood circulation. Therefore, future studies should provide increased

data collection and better examination of reflexology effects on blood pressure.

3.2.2 Pulse Rate

Comparison of the heart rate before and after the treatment showed that the average heart rate was 76.3 beats per minute before the treatment and 68.3 beats per minute after the treatment, indicating that the heart rates of all three participants decreased. Results are consistent with those of earlier studies (Machi, 2000). Then, we couldn't find significant difference in blood pressure and blood oxygen concentration, but the paired t-test detected significant differences between before and after the procedure groups ($P=0.049$).

3.2.3 Blood Oxygen Concentration

Blood oxygen concentrations before and after the procedure were increased in all participants by 1%. The results resembled those of an earlier study (Machi, 2000), which suggested that oxygen concentrations increased in some participants.

3.3 Interview Data

The following are contents of interviews about PMS symptoms conducted with the participants before the experiment.

3.3.1 Interview Items

The interview items are presented below.

Table 2: Interview items.

Item number	Detail
1	Difficulties related to defecation (diarrhea, constipation, abdominal pain, etc.)
2	Number of days elapsed since the last menstrual period at the time of data acquisition, Number of days elapsed since last menstrual period
3	Usual menstrual cycle (is the cycle stable?)
4	Presence of PMS symptoms other than defecation
5	Details of 4
6	What we are doing to solve 1 and 5
7	Other body-related concerns

3.3.2 Approaches to Symptom Relief

Because data obtained from this study were of only three participants, relating characteristics of the

physical data to the interview data is difficult. For this reason, this report presents only responses obtained from interviews as examples.

Table 3: Sample response.

Item number	Response
1	Menstrual pain, constipation, heavy bleeding during physiological periods
2	Yes
3	Not very stable. (Menstruation might last about a week)
4	Yes
5	Overeating, irritability, sleepiness, rough skin
6	Warm the body (e.g. at a hot spring)
7	Uterine fibroids, rhinitis, asthma

Future experiments will investigate how these concerns change during the course of multiple reflexology treatments.

4 CONSIDERATIONS

This chapter presents results obtained from experiments described in Section 3 and a discussion of them.

4.1 Bowel Sound Data

From this experiment, data were obtained before and after reflexology treatment to assess how the state of the intestine changes. Reportedly, reflexology relaxes and regulates the body. The difference in bowel sounds before and after the treatment assessed by this study indicate some effect on the bowel. Because the data were obtained from only three people, the frequency graphs of the three people converged to a single graph after treatment. Future research must be undertaken to clarify whether many people converge similarly, and to elucidate the meaning of this shape.

4.2 Blood Pressure, Heart Rate, Blood Oxygen Level

The results obtained for blood pressure, heart rate, and blood oxygenation resembled those of earlier studies. Results for blood pressure differed slightly from those of earlier studies. However, because earlier studies had fewer participants, the number of participants in future studies must be increased; the reliability of future data must be improved.

4.3 Interview Data

Interviews were conducted mainly to clarify the participants' characteristics. Because the interviews revealed the participants to be women with various difficulties, we believe that future experiments with women with various difficulties will lead to deeper analyses. Correlating these interview data with physical data is expected to be important when conducting multiple treatments with more data.

5 SUMMARY AND FUTURE ISSUES

This paper presents results and discussion of data obtained from an experiment conducted to verify the effectiveness of reflexology as treatment for PMS symptoms and other health difficulties women face. Future investigations will be done to obtain data over a longer period, such as one or two months, to clarify the durability of reflexology effects and the number of treatments necessary to sustain them. Additionally, an analytical model will be constructed based on intestinal sound data to elucidate the state of intestines during illness and to propose methods to alleviate symptoms.

ACKNOWLEDGEMENTS

This work was supported by JSPS KAKENHI Grant Number JP19K10808.

REFERENCES

The Japan Society of Obstetrics and Gynecology. (2018). *Obstetrics and Gynecology Diseases (PMS)*. Retrieved May 10, 2022, from https://www.jsog.or.jp/modules/diseases/index.php?content_id=13

Hitachi Consulting. (2021). *Report on the Effects of Changes in Working and Living Styles on the Future Japanese Economy and the Challenges Ahead (Summary Version)*

Nurul Haswani Embong, Yee Chang Soh, Jong Chiau Ming, TinWui Wong. (2015). Revisiting reflexology: Concept, evidence, current practice, and practitioner training. *Journal of Traditional and Complementary Medicine*, vol.5(4), pp.197-206.

Praew Kotruchin, Supap Imoun, Thapanawong Mitsungnern, Patcharin Aountrai, Maneenuch Domthaisong, Kazuomi Kario. (2021). The effects of foot reflexology on blood pressure and heart rate: A

randomized clinical trial in stage-2 hypertensive patients. *The Journal of Clinical Hypertension (Greenwich)*, vol.23(3), pp.399-400.

Natália Chantal Magalhães da Silva, Érika de Cássia Lopes Chaves, Emilia Campos de Carvalho, Leonardo César Carvalho, Denise Hollanda Iunes. (2015). Foot reflexology in feet impairment of people with type 2 diabetes mellitus: randomized trial. *Revista Latino-Americana de Enfermagem*, vol.23(4), pp.603-610.

Soheila Moghimi-Hanjani, Zahra Mehdizadeh-Tourzani, Mahnaz Shoghi. (2015). The Effect of Foot Reflexology on Anxiety, Pain, and Outcomes of the Labor in Primigravida women. *Acta Medica Iranica*, vol.53(8), pp.507-511.

Atsuko Nakahashi, Tatsuko Kobayashi, Kumiko Iguchi, Chiho Gomi, Kikumi Tanaka, Miyuki Senba, Ayako Mochizuki, Takahide Taniguchi, Miyuki Kobayashi. (2011). Reflexology-induced Changes in Defecation Status in Healthy Female College Students with Constipation Tendency. *Bulletin of the Faculty of Nursing, University of Yamanashi*, vol.13.

Yoshio Machi, Chao Liu, Maki Fujita. (2000). Physiological Measurements for Reflexology Foot Massage. *Journal of International Society of Life Information Science*, vol.18(2), pp.502-510.