



RESEARCH ARTICLE

# A Pilot Study Exploring the Effects of Reflexology on Cold Intolerance

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**Abstract**

Cold intolerance is an inability to tolerate cold temperatures and is accompanied by symptoms including headache, shoulder discomfort, dizziness and palpitations. The current study was performed to examine whether reflexology therapy affected cold intolerance in human subjects and whether the treatment was systemically effective. Ten female volunteer examinees with subjective feelings of cold were examined. After a 5-minute foot bath, 10 minutes of reflexology therapy was performed on their left foot. Skin temperature and blood flow were estimated before and after treatment, together with an interview concerning their feelings of cold and daily habits. In addition, how the recovery rate was affected by the application of a chilled-water load was also estimated. Along with significant increases in skin temperature and blood flow compared with pre-treatment at the bilateral points of KI-1, LR-3, and BL-60, a faster recovery after the application of the chilled-water load was also seen in the lower limbs on both sides. From these results, we conclude that reflexology has systemic effects and is an alternative method for treating cold intolerance.

## 1. Introduction

Cold intolerance is the inability to tolerate cold temperatures. In recent years, it has been reported that from one third to one half of women in Japan suffer from cold intolerance [1]. Although many women suffer vexing symptoms, in general, it is not considered to be a condition that requires diagnosis and treatment by a medical professional. It is much more common in women undergoing menopause. In addition, cold limbs, a cold body, difficulty in sleeping and other symptoms such as headache, shoulder stiffness, backache, dizziness and palpitations often

accompany cold intolerance and may interfere with activities of daily living and quality of life [1].

In reflexology, the foot is considered to be representative of the rest of the body. Reflexology, also called zone therapy, is an alternative treatment method involving the practice of massaging, squeezing or pushing on parts of the feet, and sometimes the hands and ears, with the goal of inducing a beneficial effect on other parts of the body. It is very popular in the high-stress society of Japan and is widely used to reduce tension, induce recovery from fatigue, and to refresh the mind and body. Reflexology is said to be effective at promoting blood circulation, but

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at present, there is little scientific evidence that it improves blood flow in people who suffer from sensitivity to cold temperatures. Hence, it is necessary to conduct a study into its effects. In general, most cold intolerance is considered to be caused by circulatory disorders of the blood and lymph fluid [2]. According to reflexology theory, areas of the foot correspond to areas of the body. In contrast, the Traditional Chinese Medicine (TCM) view is that the spleen is considered to affect the limbs, and cold intolerance is mostly attributed to Yang-deficiencies of both the spleen and kidney. It is also said that “spleen deficiencies and cold syndrome exist simultaneously”. In this pilot study, in addition to a discussion as to whether reflexology is effective at improving the blood circulation of the lower limbs, we also estimate whether reflexology has general effects on cold intolerance by comparing the changes in the treated foot and the untreated foot in each person.

## 2. Materials and Methods

### 2.1. Subjects

As women are most commonly affected, 10 females were recruited in our study as a basis for assessing the subjective symptoms of cold limbs, especially cold feet. During 20 minutes of acclimatization in the experimental laboratory at a room temperature of  $25 \pm 1^\circ\text{C}$ , body weight, body fat percentage, body moisture percentage, muscle percentage and basal metabolic rate were measured using a Body Composition Health Meter (AITEC Tokyo, Japan). A questionnaire mainly including questions regarding lifestyle, fitness habits, chilled sites, and menstruation was administered (Table 1).

### 2.2. Study design and methods

According to reflexology, invisible waste material accumulates in the foot. To remove this invisible waste material, 5 minutes of foot bathing at a temperature of  $40^\circ\text{C}$  was initially performed (Figure 1A). After that, the wards of the sole, instep, and the lateral aspects of the left foot were stimulated five times each for a total of 10 minutes with a moderate strength using digital joints or finger pressure (Figure 1B). For comparison, the opposite foot was left untreated.

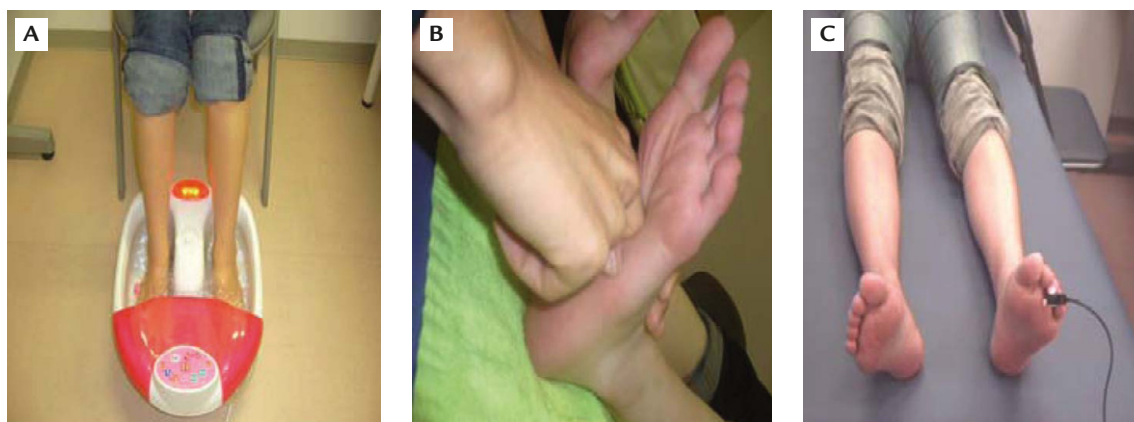
Figure 2 shows the experimental process of our study. Instant skin temperature was measured at points LR-3 (*Taichong*), KI-3 (*Taixi*), BL-60 (*Kunlun*), and KI-1 (*Yongquan*) with a thermometer (ST-717; Scalar, Tokyo, Japan). About 30 seconds of blood flow in a stable condition was recorded with a laser blood flow meter (Cyber Med CDF-2000; OAS Co. Ltd., Tokyo, Japan) and a fixed sensor placed on the back of the third toe. The mean for the time period was then calculated. In order to estimate the recovery from the chilled condition after treatment, both feet were immersed into a water bath

**Table 1** General interview sheet

Questionnaire items ( $n=10$ )

Chilled region (upper limb, lower limb, waist, others)  
 Smoker (Y, N), Drinker (Y, N)  
 Nutrient intake [times of meals, content (cereal or protein)]  
 Physical activity, movement (Y, N)  
 Menstrual cycle disorder, accompanying cramp  
 Condition of the lower back and limbs (weakness or swelling)

Y=yes; N=no.



**Figure 1** Photographs of footbath, reflexology therapy and blood flow measurement. (A) A water bath maintained at  $4^\circ\text{C}$ . (B) Reflexology therapy administered to the plantar reflection wards of the left foot using a finger joint. (C) Measurement of blood flow with a fixed sensor placed on the back of the third toe.

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