

# Design Study of Adjuvant Treatment and Prevention of Chilblain in Children with Ginger

Xuecheng Dai\*

Brunel Design School, Brunel University London, London UB83PH, UK

**Abstract.** In rural areas of central and Western China, chilblain is a common seasonal skin disease among local children. Its symptoms are mainly skin redness, itching, peeling and even ulceration, which has a negative impact on children's body and psychology. Due to the lack of attention and scientific cognition on the treatment and prevention of chilblain, children with chilblain are prone to serious symptoms and have a high probability of recurrence. This study conducted field investigation and user visits, earnestly considered the multiple needs and scientific basis of users. This study combined with the different characteristics of treatment and prevention and redesigned the primary methods of chilblain disease treatment and the acceptability of various schemes for children in the initial stage of chilblain prevention and treatment. Using the local traditional methods and natural materials, this design tests and improves the treatment methods of local ginger soup and ginger juice smearing. Through the test of children's preferences, the application methods of ointment and the redesign of medicine bottles that can be accepted and used by children are added in the traditional treatment stage, as to design and produce new forms and carriers for chilblain treatment for children, more loved and accepted by children.

## 1. Introduction

According to a survey conducted by China's National Bureau of Statistics in 2018, there are still 1.7% of the population in extreme poverty in China [1]. As a result, children from these families lack parental care and education. Many of the children suffer from very severe chilblain in the winter due to the cold and wet weather. Chilblain is a kind of skin lesion commonly present as erythematous, edematous acral lesions [2], which often last for 6 weeks to 3 months. It is often induced by exposition to cold and wet conditions [3], and acute chilblains were observed during COVID-19 pandemic in children[4]. Chilblain disease in children should be prevented and treated with intervention in the early stage[5], otherwise it can lead to serious symptoms such as ulceration or scarring[6]. The current treatment for chilblain is mainly prophylactic and adjunctive medication applied in doses of mostly 3-4 times a day [7], and there is still a large gap in the treatment of chilblain in children. During the period of illness, many children feel very self-conscious due to the unsightly redness and itchiness of their chilblain wounds and try to cover them up with clothing. In addition, they are too ashamed to take medication in school. Or engage in inappropriate treatment, which reduces their motivation to participate in activities and can lead to psychological problems.

Current customers prefer natural materials to synthetic ones during treatment [8] especially for children. Ginger

as a low-cost natural ingredient has long been used in Chinese medicine to ward off cold and treat chilblain [9]. The content of ginger (gingerols, shogaols and paradols) is known to relieve pain, reduce inflammation and treat chills[10]. Ginger and its natural extracts were recognized as safe (GRAS) ingredients by the Food and Drug Administration (FDA) and have good healing properties as both an oral and topical application [11], but its pungent taste is not acceptable to some people [12].

Chilblain is a chronic illness, and the treatment of this illness requires attention to the child's mental health[13]. The use of play and interaction with family or friends as a treatment modality can help to increase the child's motivation to treat the disease, and to relieve the stress and depression associated with the illness[14].

This project aims to optimize traditional forms of treatment for children aged 5-10, to select from a wide range of treatment forms that are scientifically effective and acceptable to parents and children. This study uses simple, natural ginger as a treatment material and optimizes the process and ease of use and to explore a new form of treatment that is acceptable and convenient for children to use at home and at school. The purpose of this study is that children will be able to play with their friends in a group therapy and prevention process. Through innovative form and function design, children can remind each other to reduce the incidence of forgetting to apply the medicine and realize that chilblain is a common disease that can be effectively prevented and cured. It can

\* Ninadaixc@gmail.com

reduce the psychological problems of children’s low self-esteem due to the horrific nature of chilblain wounds, and to reduce the burden on parents to help apply the medicine.

## 2. Requirements Analysis

User interviews and user journey map were mainly used in the process for product requirements analysis.

Eight target users were selected for user interviews, four of whom were children as direct target users and four of whom were caregivers as indirect target use, to gain insight into user needs. The interviewees were asked three main questions: Do you prevent and treat chilblain as soon as possible? Do you feel inferior because of chilblain wounds? What type of chilblain treatment is currently used?

The interviews revealed that past treatments tend to be resistant to children and most children do not like overly

stimulating flavors and direct administration. Secondly, as children are unsupervised during school hours, it is easy for children to forget to apply the medication or for some children to resist applying it on school premises, which does not guarantee maximum efficacy and can also lead to recurring chilblain.

The user journey map below (Fig. 1) takes a six-year-old girl in China, Chen Yufei, as a typical example and analyses the entire process. The process was divided into three main processes: find chilblain, try to treat chilblain and after treatment. In each process use photos to reflect her situations, as well as psychoanalyzing and mapping her emotional profile and interviewing her to understand her feelings at each stage and to analyze her inner needs, emotions, and problems. Three main issues can be identified in the user journey map: feel inferior, reluctant to use medicine and easy to relapse.



Fig. 1. User journey map.

## 3. Method

### 3.1 Design Solution

In the design process of the product, a continuation of the traditional application of the treatment with the innovation use of ginger fibers as an application tool. The target use context was sought, and the product was substituted in the use scenario. As the main theme of the project is chilblain treatment and prevention, the “fire” was taken as a typical element in the fight against chilblain and made it a more important part of the design. The fire represents warmth and hope, bringing physical and psychological warmth to the child being treated.

In designing the way of use, the playful form of coloring was used, which is common among children, with similarities to the way the ointment is applied. The idea of incorporating the painted form into the design was born. This study takes two different approaches: the brush application can be applied in large patches and the stamp approach can be applied to specific areas for prevention and treatment. This study using fun patterns to increase

children’s interest in using it. The painted form also encourages children to apply it to each other, treating it in a playful way, while also making children aware that chilblain is a common disease that can cured in a fun way. It is hoped that the combination of the ginger fiber form and the coloring will be more acceptable to children and parents.

### 3.2 Size of The Product

The target users of the product are children aged 5-10 years old who are susceptible to chilblain, and a human factor analysis of the product was carried out on children’s hands. According to GB/T 26159-2010, the approximate hand size of the target user, a child aged around 8 years old, can be found in

Table 1.

Table 1. Hand size of 8-year-old in China.

Age	Gender	Hand Length	Hand width
8	Male	142.0	64.7
8	Female	139.5	62.3

The product dimensions were therefore chosen to be approximately 50-100 mm in width and 50-120 mm in

height (Fig. 2), with a near oval or polygonal shape to facilitate the grip of the child.

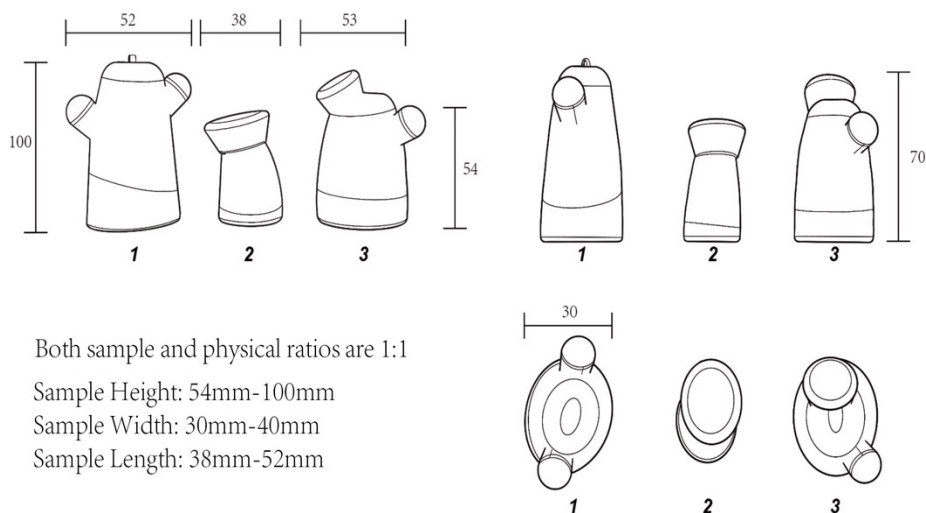


Fig. 2. Size of the products.

#### 4. Results

As this product is positioned as a child's product, the style is lively and sunny. In designing the form, the first consideration was the near-oval shape, and the material used for the brush, stamp and bottom storage part was

continued from the ginger paste, while the rest of the product was designed with a natural beige color clash to give it more vitality. The stamps and brushes are used in the same way as in the sketch but interspersed in the form of a stopper for versatility. The design is designed to be unique and fun for this age group, so the design is intended to be unique in every form (Fig. 3).

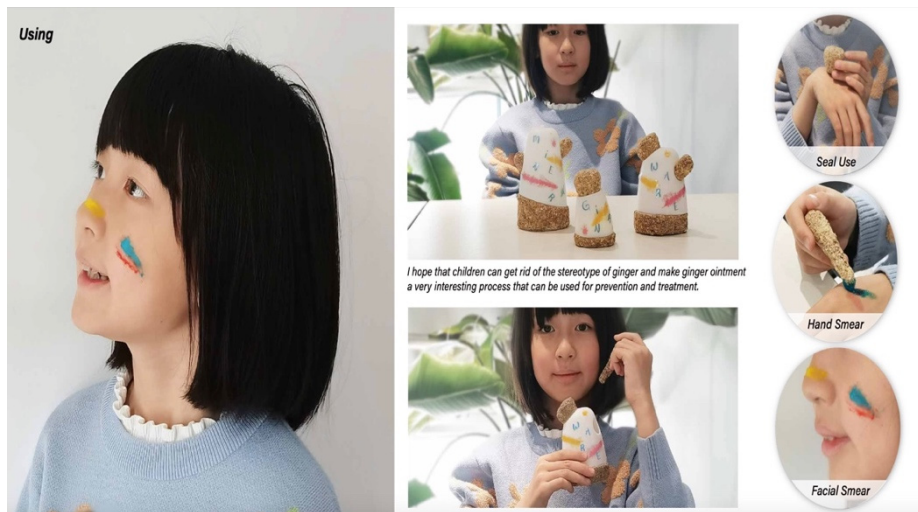


Fig. 3. Final product.

#### 5. Conclusions

This study innovatively uses children as the main subject of research on frostbite treatment, based on the characteristics of chronic frostbite treatment, the psychological aspects of frostbite treatment and parental expectations, and the natural material "ginger". This study also presents an innovative method for children to apply ginger in a fun way, effectively increasing children's motivation for frostbite treatment and reducing their low self-esteem due to frostbite.

Due to time and financial constraints, this project has not been able to popularize the use of this interesting treatment and further medical research is needed to confirm the dosage of ginger ointment and to explore more interactive forms.

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