

# Design of Children’s Wearable Moxibustion Instrument Based on Emotional Design Theory

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## ABSTRACT

For the children’s group, excessive use of antibiotic treatment will damage children’s liver and kidney function, produce drug resistance, and affect children’s health. While Chinese moxibustion has the characteristics of safe, effective and green, more suitable for children, and has a positive effect on the healthy growth of children. However, there are no products for children in the current market of moxibustion instrument, and there are problems in treatment mode, operating system, use effect and user experience, and blind use is easy to cause safety problems. This paper proposes a wearable children’s moxibustion instrument product design based on emotional design theory, summarizes and analyzes user characteristics and needs, completes the product innovation, and improves the user experience.

**Keywords:** Emotional design, Children moxibustion instrument, Wearable product, User experience

## INTRODUCTION

### Research Significance

The “Healthy Children Action Enhancement Plan (2021-2025)” issued by National Health Commission PRC proposes to strengthen children’s TCM services and promote children’s TCM health care into the community and into families (2021). For children and adolescents with poor constitution and prone to colds, fever, food accumulation, anorexia and other health problems, western medical treatment methods cannot cure completely and are prone to side effects such as bacterial resistance and liver damage after using too many antibiotics, TCM moxibustion has the characteristics of easy realization, obvious effect and no adverse reaction, which effectively strengthens children’s resistance and promotes their growth and development. With the continuous enrichment of technology, consumers’ demand for products that possess personalization and manifest spiritual pleasure and physical comfort is getting stronger (Liu, 2012). Therefore, with children as the target user group, it is of great relevance and commercial value to create moxibustion instrument products that regulate the body and enjoy the use experience, taking into account the physical characteristics and behavioral activities of children in the treatment process.

## Research Status

### (1) Product performance of moxibustion instrument

1. Efficacy of moxibustion therapy: Current studies believe that moxibustion has the characteristics of safety, effectiveness and green. It uses moxa sticks to ignite warm and hot stimulation, and the methanol extract of the product from the burning of moxa leaves can regulate the human body through thermal action, near infrared action and biochemical action, so as to dredge the meridian, disperse cold and relieve pain.

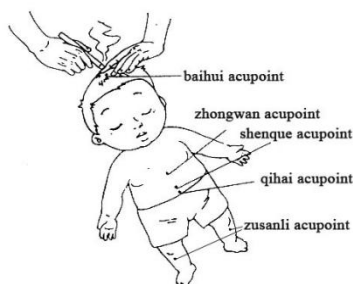
2. Daily conditioning of moxibustion in children: because children's bodies are relatively tender, they are prone to suffer from diseases in the spleen, stomach, respiratory tract and other tender places, such as wind cold, fever, cough, asthma, abdominal diarrhea, food injury, etc., moxibustion can be used as a means of diagnosis and treatment and daily conditioning (Figure 1).

### (2) Comparative study on moxibustion instrument products

Moxibustion instrument products mainly use moxa wool, moxa cake, moxa leaf essential oil and other extracts containing "moxa" as the essence of moxibustion. Through electric heating, heat spurs are generated to make moxa leaf stick to the deep skin and stimulate moxa molecules to penetrate deep into the skin. In this paper, seven popular moxibustion products were selected from Jingdong shopping platform for analysis and comparison from the perspective of heating principle, technology and mobility, as shown in Table 1. The study found that smoke-free, electronic device heating, portable, wearable are the key factors for users to choose, and the pursuit of modernization, comfort, and good use experience.

## Research Purpose

Children in the process of growth of some diseases are more suitable for moxibustion physiotherapy compared to Western medicine, but there is no moxibustion instrument products for children on the market, and the existing products are complicated to use, poor user experience, and even improper operation with the risk of burns and other problems. In this paper, we take children as the target user group and analyze how to design a wearable moxibustion instrument based on emotional theory. It takes into full consideration of users' physical characteristics and behavioral activities, and aim to bring a pleasant experience of use and service for users.



**Figure 1:** Pediatric moxibustion operation instruction chart. (Adapted from Shan, 2014).

**Table 1.** Comparison of product categories of moxibustion instrument (author drawing).

Heating principle	Product	Technology	Mobility
Moxibustion burning	Moxibustion box	Zipper smoke insulation, multiple joint, rotating smoke control	Wear elastic bags
	Keai Moxibustion box	Rotary temperature control smoke control screen	Patch, double-sided tape
Electronic heating	Hot compress sitting moxibustion instrument	Dry moxibustion wet steaming, extraction chamber, red light penetration, fireworks processor, intelligent control	move
	Moxibustion patch	Graphene heating, far-infrared light waves, intelligent timing, Third grade temperature	attach
	Moxibustion instrument	Three-color spectrum, spiral duct, ceramic cake chamber,	move
	Electrothermal knee pads	Intelligent control	Mechanical adjustment
	Radiation ironing moxibustion apparatus	360° far infrared heating,	wear

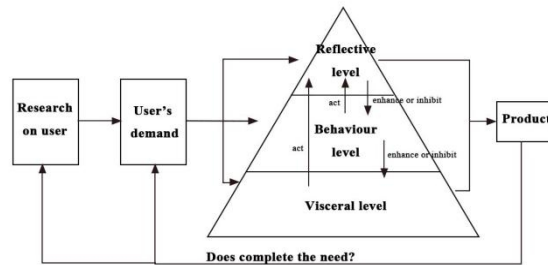
## Research Method

1. Literature research method: In this paper, the relevant contents of moxibustion instrument products are extensively collected through desk research, and keywords such as emotional design, children's products and moxibustion instrument are searched and consulted on platforms such as CNKI, web of science and Google Academic, etc., so as to summarize the knowledge needed for research and provide theoretical knowledge guidance for design.

2. Research method: In this paper, the pain points and emotional needs of target users are understood through semi-open interviews and questionnaires, and the real needs of users are mined through further analysis, so as to provide data for analyzing the use details and experience of products from the perspective of users in the design process and improve the design content.

## THREE-LEVEL THEORY OF EMOTIONAL DESIGN

The three-level theory of emotional design was first proposed by cognitive psychologist Donald Arthur Norman (2015), who divided the design and its goals into three layers according to the depth of experience provided by the product: the instinctive layer, the behavioral layer, and the reflective layer,



**Figure 2:** The application of emotional design theory (adapted from Sun, 2008).

as shown in Figure 2. The instinctive layer refers to the initial sensory stimulation brought by the product, where the brain directly translates the information received by the sensory channels into first impressions through an instinctive response, corresponding to the product appearance attributes. The behavioral level design refers to the emotions triggered by the user in using the product, and the design should improve the user's experience in the process of using the product based on the basic functions. The behavioral level of activity can be enhanced or inhibited by the reflective level, which in turn can also enhance or inhibit the instinctive level (Ding et al., 2010). The reflective level, unlike the immediate experience, is the highest level of brain processing. It is influenced by instinctive and behavioral levels, and is intertwined with individual emotions, consciousness, understanding, personal experience, cultural background, and many other factors (Peng, 2021), and can be designed to give users emotional enrichment and meaning to their lives over time.

## DESIGN PRACTICE

### User Study

The research object of the design contains children and parents. This paper will summarize the physiological and psychological characteristics of children, and analyze the behavior and needs of users in the process of moxibustion activities, and base on the research to discover the problems, to better meet the functional and emotional needs of users.

#### (1) Summary of child user characteristics.

**Physiological characteristics :** children's physiology is in a state of constant change and development, and children under 12 years of age have similar height and weight development (Liu, 2012), with basically no gender gap (see Table 2).

**Psychological traits:** children's personality and psychology is developing, including cognitive level traits, personality traits and emotional aspect. The cognitive traits include observation memory and thinking in childhood; Personality traits include the development of social awareness of self, worldview formation, and personal interest abilities; And emotional traits include the

**Table 2.** Physiological characteristics of children in different age groups (author drawing).

Age/year	Height/cm	Neck	Shoulder	Extremities
3–4	95–105	Neck tilted forward, Tilt angle occurs	Shoulders protrude outward, Widening of the chest	Longer upper limbs and greater dorsal curvature
4–6	105–125	Head to body ratio of 5.2	reduced shoulder thickness	slender body shape, Smaller belly
6–12	125–155	Clear neck	Wider shoulders	Gap between men and women

content of emotions, expression of emotions, and self-control emotions (He, 2022).

#### (2) Analysis of the process of moxibustion activities

When children feel unwell, they are naturally irritable and resistant to treatment by their parents and doctors. The use of comfortable and fun moxibustion products in the familiar environment of the home can help children relieve their physical problems and shape the activity of moxibustion into a fun and pleasantly memorable behavior, and the behavioral analysis is shown in Table 3.

### Demand Analysis of Moxibustion Instrument Based on Emotional Three-Level Theory

In this thesis, users' needs are discovered through the method of questionnaire interview, and their emotional needs for moxibustion instrument products are analyzed by combining the three levels of emotional theory (see Table 4). And according the analysis, good products can be created to bring good physical therapy effect and user experience to users.

1. Instinctual level: The design of instinctive level is to directly feel the product through the user's senses, leaving a good first impression so as to stimulate the user's positive emotions. For children with weak cognitive ability, instinctive stimulation can play an important role in receiving products and generating interest and goodwill. Studies have shown that children's perception of color is weak, but colors with changes in brightness and saturation can bring more emotional responses (Song, 2019). Modeling should

**Table 3.** Analysis of children and parents moxibustion activity process (author drawing).

Use process	Children behaviour	Parents behaviour
before	Explain the illness and calm the emotions	Prepare the environment, calm the child, and determine the treatment plan
during	Actively cooperate with moxibustion activities	Use the product correctly and accompany
After	Protecting, helping to collection	Storing products, settling children, and protecting after treatment

**Table 4.** Emotional needs analysis of users (author drawing).

Three levels	Children users	Parents users
Instinctual level	Fun, friendly	Clean, safe, simple
Behaviour level	Interactive, comfortable, unlimited	Convenient and easy to operate, effective and efficient
Reflective level	Exploratory, rewarding	Long-term persistence, accompany

also take full account of children's psychological needs and aesthetic ability, from the perspective of children to increase the aesthetic flavor of the design.

2. Behaviour level: After the communication and interaction between the user and the product, the emotional experience of the behavioral layer comes from the product's functionality, ease of use and feeling of use. On the basis of providing the basic functions of moxibustion, users' experience and details in the process of use should be considered, so that the operation mode of the product conforms to users' habits and man-machine, and the utility, convenience and other characteristics of moxibustion instrument can be satisfied, so as to meet the emotional needs of users' behavioral level and produce pleasant user experience.

3. Reflective level: The demand for reflection comes from users' thinking about moxibustion after using the product, and gives meaning to life. It mainly produces the value of education for children, cultivates their health awareness and inherits the traditional Chinese medicine culture. Thus it can arouse users' sense of achievement in obtaining a healthy body and enhancing their confidence in the Chinese national culture.

### **Emotional Design Practice of Wearable Children's Home Moxibustion Instrument**

In the process of product design, solution analysis is carried out based on the emotional needs of the product in the early stage (see Table 5). And the design combines user's emotion and behavior to improve the way of thinking of users and their external situations, so as to bring pleasant experience to users.

#### **(1) Instinctual layer design**

**Product composition:** Moxibustion instrument consists of moxibustion patch and host. The patch is made of medical-grade adhesive sponge, embedded sensor equipment and replaceable permeable drugs. The main engine has a display device and an energy storage function, and the two are connected by wires.

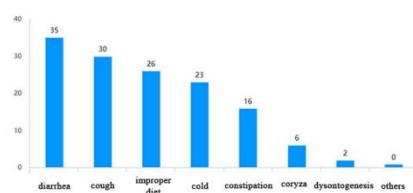
**Appearance:** The color is red and blue with high brightness, which are preferred by children. Bright colors with large color blocks can produce visual stimulation for children users. The shape has the characteristics of thin, simple, the overall use of "square, round" elements, to bring a warm and soft impression to the user. And the material is better made of plastic and rubber, with mild touch and fine friction texture.

**Table 5.** Design and analysis of emotional needs of children moxibustion instrument products (author drawing).

Criterion layer	Sub-criterion layer	Requirement analysis	Design scheme
Instinctual Level	appearance color	Soft and kind	Curved rounded element
		Simple and comfortable clean	Material plastic smooth temperature High brightness
	Sound effect interface	associable	Cartoon characters are abstract in color anthropomorphism
		function Easy to use	affinity
	Easy to understand feel	Rich guidance	Multiple response cue Flat unity
intimacy		Cartoon cute association Patch moxibustion	
Behaviour Level	educational Sense of achievement	Electric heat can moxibustion Display scheme	Interface sound display Protection mechanism
		interest appearance color	Fault-tolerant safety
	Sound effect interface		Simple and convenient Efficient guidance Clear indication Multi-channel interaction
		function Easy to use	Immersion experience Unconscious use
	Easy to understand feel	Knowledge popularization independence	
educational		Harvest satisfaction	Get results, reward mechanism
	Sense of achievement interest	cultural confidence exploratory	Cultural inheritance gamification

## (2) Behavior layer design

Basic function: Through the questionnaire research found that in the children's stage (Figure 3), diarrhea, cough, food injury, cold, constipation and stunted growth and other health problems are more frequent, and suitable for moxibustion means of physical therapy. Such as wind chill cold can use moxibustion at DaZhi, FengMen, and Feiyu three points for 15 minutes, 1–2



**Figure 3:** Types of diseases that children are susceptible to (author drawing).

times a day, adhere to the effective results. Thus the moxibustion treatment content of the above diseases is the main function of the product.

**Wearable portable use:** The flexible strain sensor equipment with good stretchability and considerate attachment is used as the moxibustion patch, which is directly attached to the user's skin. And there are multifunctional signs sensors accurately monitor the individual, and receive and transmit the data of the detection device to the host through the low-power Bluetooth wireless communication technology. And it can present the user's health status and moxibustion treatment and health care plan visually.

**Interaction design:** For the children's group, intelligence and judgment are in the process of development, it is necessary to establish an intelligent system for real-time monitoring, set temperature thresholds and operating limits, strengthen instructions and timely feedback, and improve the safety and fault tolerance rate of the product. Interface design for different information content using color system which consistent with life experience and psychological subconscious. And sound effects is better using cartoon anthropomorphic communication, so that the product resonates with the user.

### (3) Reflective layer design

**Cultural knowledge popularization:** The display interface presents the development of the traditional culture of moxibustion health care, popularizes science for children users easy to encounter health problems in life and physiotherapy programs. So as to enhance the awareness of health care while inheriting Chinese culture, strengthen pride, and gradually improve the physical quality, promote the use of products.

**Gamification fun design:** Combining moxibustion activities with game mechanism, users can play interface games while moxibustion, and get gold coins and other rewards upon completion of physical therapy. Feedback design brings "like" and "interesting" experience to users, and brings certain encouragement and process feedback to users, so as to form a good cycle and promote users to adhere to long-term use.

## CONCLUSION

As an important achievement of Chinese medicine in China, "moxibustion" is of great significance to modern people's life and medical development. Nowadays, in the environment of epidemic, people generally pay more attention to health, especially for children, the development of new era of Chinese



medicine physical therapy products can effectively improve the national physical quality of the new generation of young people. The design should be based on emotional design, dedicate to attracting users through operation, experience and content, so it can bring people a more comfortable, convenient and pleasant use experience, and satisfy children's need to look outward for communication, love and respect.

## ACKNOWLEDGMENT

The paper I will submit is the result of my independent research and writing under the guidance of my advisor, Professor Hong Chen, and it is supported by Shanghai Summit Discipline in Design. The text and research results of others quoted in the paper, no matter how they are published, will be explained in the paper.

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