Design of Smart Household Beauty Apparatus Targeting the Young Consumers

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ABSTRACT

Trivialities of using domestic skincare tools should be urgently addressed for they dissatisfy consumers in using the tools. The research aims to focus on how to improve users' satisfaction when they use the tools and propose a design plan on a new domestic skincare tool, including the product style design in line with ergonomics and the functional design to improve users' satisfaction. By using this skincare tool, users can enjoy more complicated skincare in a shorter time. This research targets the skincare needs of young consumers at home, discusses innovations of skincare tools in usage, provides innovative thoughts for the further development of domestic skincare tools, and offer solutions from the perspective of users.

Keywords: Product design, Design of users' satisfaction, Ergonomics, Skincare tool design

INTRODUCTION

As consumers' increasing cognition and requirements of their appearance in China, the market of chemicals used in daily life reflects a remarkable growth capability (Davies & Raskovic, 2018). Intellectualization draws more and more concerns from the market of chemicals used in daily life in order to fulfill people's requirements for beauty.

In today's skincare field, intelligent products have change part of consumers' habit of using products through intelligence revolution. For example, La Roche-Posay, a brand under L'Oréal, rolled out a telescoping sensor to monitor personal UV exposure, positively guiding its users to conduct safe sun protection behaviors. Similar products with intelligent technologies are emerging in the market. Influencing the habit of using products by intelligent technologies, in essence, is to provide consumers with better experience. Intelligent skincare products change consumers' habit of using them, which are in line with the inexorable trend of consumption upgrading (Bin, 2018).

The author hopes to explore the sore point of consumers in skincare by investigating and studying the current situation and trend of development of skincare industry, and seek reasonable solutions from the application of intelligent technologies in skincare.

PRE-DESIGN ANALYSIS

In order to look for the direction of design, the author wrote an in-depth questionnaire for interview based on the analysis of the skincare market and under the guidance of experts in the daily chemical industry (Zhi, 2019), and then produced a report for reference in the design of intelligent daily chemicals.

Personal in-depth interviews were adopted to collect as many as details and users' needs. 7 target users whom the designed product will serve were interviewed at home. Discussions were held on three aspects, including the experience in skincare, trend of the skincare industry and trend of intellectualization. Each interview lasted for about 90 minutes.

The trend of skincare is concluded as follows according to the interviews and literature information.

Younger consumers. Teenagers are aware of the marginal social benefits brought by a perfect complexion at increasingly earlier ages. They start to take care of their skin from their secondary school age, and most college students protect their skin more meticulously.

Simpler skincare. Accelerated pace of life and increasing life pressure wear out people who start to be tired of daily skincare. Part of consumers will reduce their use of skincare products and sacrifice effectiveness for more breathing space.

Revolution of new technologies. Nanotechnology and other technology offer new opportunities to enable the production of the product (Zhou et al. 2021), while radio

frequency and infrared technologies have been widely applied in the production of skincare tools(Beasley & Weiss,2014).

DESIGN CONCEPT

Breakthrough points of design are concluded by collecting and sorting users' behaviors and thoughts during the in-depth interviews.

In busier daily life, people have higher requirements for skincare, but they can spend less time on it, leading to contradictions. Therefore, it's concluded that a skincare tool which reduces steps and guarantees the effect can address current problems facing consumers in daily skincare. The tool should be designed to be smaller for easily fetching, and compatible with other skincare products which can be introduced with the help of the tool. The product is designed to be an intelligent skincare tool in the preliminary conception.

ANALYSIS OF RELEVANT TECHNOLOGIES

The author sorted and concluded technologies which can be used in the product after analyzing a large number of literature and online resources.

Analysis the mechanism of skincare tools. Mainstream skincare tools on the market adopts technologies including ultrasonic introduction, electro-ionic introduction, MASS vibration, radio frequency (RF), red/blue spectrum LED, infrared radiation (IR), EMS microcurrent and cooling (Reddy & Hantash, 2009). Given the frequency of use and effect, IR, red/blue spectrum LED and ultrasonic are more suitable for daily skincare tools.

Analysis of sensing technology for skin test. The design requires that a process should be begun when the device touches users' skin on their faces. In order to achieve this goal, sensing technology can be adopted to judge whether the tool touches skin. After investigation and study, the author considers that a sensor for skin test is applicable to this design. First, a sensor for skin test can generate acute signal intensity from skin touch (a slight touch), which has been widely applied to various kinds of intelligent products that need to sense the skin or implement an action by touching the skin. Secondly, users only need to attach the sensor on an inside wall of the plastic or metal casing to ensure the product's aesthetic and waterproofness.

Analysis of automatically dispensing limited liquid. This tool requires to be equipped inside with an automatically limited liquid dispenser. Now, there's a new Liquid extractor which can control the runtime and the liquid dispensed by a circuit wafer and is applicable to transmitting liquid materials of different viscosities or with granules via its peristaltic

pump, which can avoid damage to materials during transmission(Lvwen, 2010). This tool is for technical reference in the final solution through technical analysis.

DESIGN DEVELOPMENT

Supported by the aforesaid design investigation and study, the author redesigned the process of using the domestic skincare tool in this research in order to improve users' satisfaction in usage, and carried out product development targeting this process.

Functional design

Three innovative functions of the product developed in the research are proposed on the basis of users' sore point in order to address the tediousness of skincare steps and other problems.

Intelligent skin sensor. The sensor starts to work after a user press the "on" button and touch the skin with the device's head.

Automatically limited liquid dispenser. Each time when the tool touches the skin, it will automatically dispense essence on the skin, and the components of the essence differ according to the number of touches.

Auxiliary functions for skincare. auxiliary functions will be started each time when the tool touch the skin, including ultrasonic and red/blue spectrum LED for skincare and essence introduction.

Process of using the skincare tool is as follows.
The tool starts working when a user presses the button controlling all the process, and the entire skincare process begins when the user touches the skin with the device's head. The head will dispense limited toner and generate IR when the tool first touches the skin, and IR will be turned off when the device leaves the skin; the head will dispense essence, generate red light and ultrasonic when the head touches the skin for the second time; the head will dispense another essence, generate red light and ultrasonic when the head touches the skin for the third time; the head will generate blue light when it touches the skin for the fourth time; the device will be off when it stops touching the skin. During the abovementioned process, the switch of modes is determined by whether the tool touches the skin and how many times it touches the skin, which can be operated easily. Besides, a user can control the four sub-processes by 4 small buttons (Figure 1).

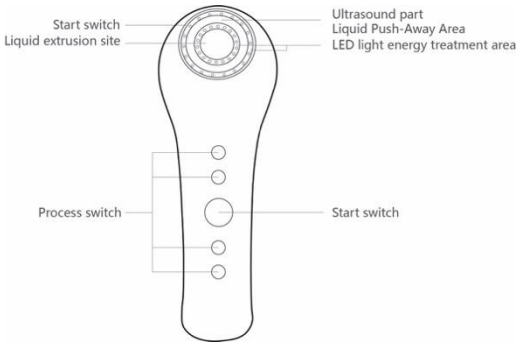

Figure 1: Illustration for the product functions

Exterior Design

The author investigated and studied the styles and features of popular skincare tools on the market, sorted and analyzed collected information. Thereafter, the design with a round, simple and clear style is adopted. The main body of the product is a handheld skincare tool with 5 buttons and a charging base. The product with a white matt exterior can reduce users' eyestrain. There's a metallic colored button on the handle; a pit is designed to help spread toner and essence evenly and easily, and avoid leaks (Figure 2).

Figure 2: Renderings of the product

According to the Chinese adults' body size in GB10000-1988 (1988) and GB/T16252-1996(1996). The handle is designed to be 125mm in length (longer than adults' hand width but not their hand length); considering the style requirements, the handle's maximum outer diameter is designed to be 50mm, while the minimum outer diameter is 46mm. Functional buttons are distributed according to the frequency of utilization. The average widths of male and female thumb joints are about 21mm and 19mm. The middle button is with the diameter of 15mm, other four buttons are with the diameter of 8mm, and the distance between each button is 5mm for the fingertip's width is shorter than the width of a thumb joint and mistaken

touches should be avoided. The diameter of the part where the tool touches the skin is designed to be 50mm. The size of the product's main body is 72*220*75 (mm) and the size of the base is 80*83*80 (mm) (Figure 3).

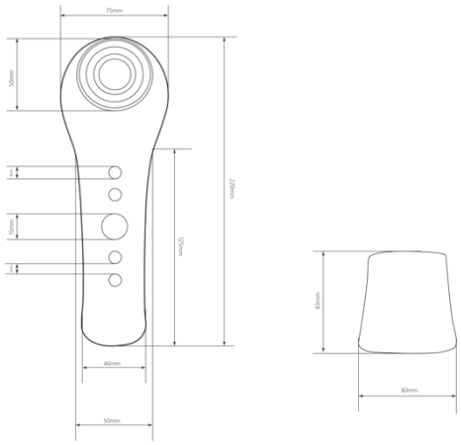

Figure 3: Diagram of each size of the tool

In addition, the product structure was simply designed (Figure 4).

Figure 4: Renderings of exploded product structure

DESIGN EVALUATION

The final evaluation includes the user test and the expert assessment. At the end, the user test was conducted in the five target users. In the test, each tested person held a product model while watching a demonstration video, and graded according to Likert Scale while experiencing the product style and functions. The result shows that the users were relatively satisfied with the product. They thought they had a cordial feeling towards the product's

appearance, and the product could effectively reduce the time of using a skincare tool, improving their satisfaction with domestic skincare. In addition, sophisticated skincare experts with long working experience in the daily chemical industry were invited to assess the design plan of the intelligent skincare tool. They suggested that the plan can effectively address some problems facing users in usage and pointed that the innovative shot is of guiding significance in skincare devices.

DISCUSSION AND CONCLUSION

This project aims to design and study domestic skincare products with a promising future, and hopes to improve users' satisfaction in usage through innovations in design. This research discussed users' sore point in skincare, studied innovations that can be made in the process of using domestic skincare tools in the context of impacts brought by intellectual technologies, and provided innovative thoughts for the further development of domestic skincare tools.

This research has received certain user recognition in the functional design of the product, but there are still many details to be improved in the style. For example, a round, symmetrical and regular shape can increase the closeness between the product and users, but these features reduce the product's sense of science and technology (Yang & Jiang, 2021). Besides, the design has some shortages due to the limits of the author's abilities and time. For example, the current model hasn't realized all functions and applied them in the product. Therefore, technologies will be improved. In addition, a small range of user test cannot fully reflect the design effect. Hence, a user test with more participants should be organized.

In conclusion, the research is to design a product which can improve users' satisfaction in using domestic skincare tools. In the future, we hope that the design concept of this project can serve more users who require domestic skincare and help them improve their satisfaction.

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