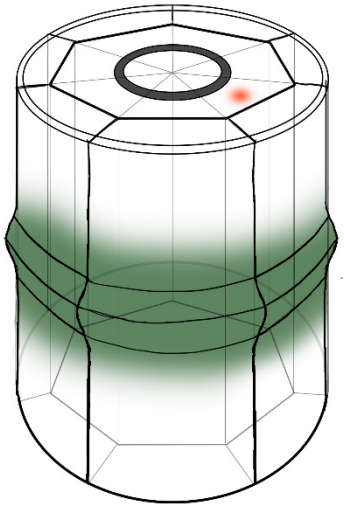
Pill Box for Adult Daily Taking Medicines



By Wanqing Liu

Submitted to OCAD University

in partial fulfillment of the requirements

for the degree of Master of Design

in

INCLUSIVE DESIGN

Toronto, Ontario, Canada, May, 2023

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Abstract

A large number of people in China suffer from chronic diseases and need to take medication for extended periods of time. To avoid taking medication repeatedly and incorrectly, pill boxes that have been designed to support correct usage are an essential need. This paper focuses on the user experience of pill boxes, using Norman's three-level theoretical framework of Emotional Design as a guide. The design of my own innovative pill box and app was informed this framework as well as by an analysis of my own daily experience and behavior patterns of taking medicine, and comparisons with competing products in the market to extract design pain points and considerations. The pill box is designed in the shape of a bamboo tube and contains two parts, a timer and seven boxes, which are magnetically attached to each other. When the set time comes, the indicator and buzzer will be activated and the corresponding pill box will fall down, requiring the user to take the medicines and return it to its place. Users can manage medications, set reminders, change the status of the boxes and view medication taking records on the app. This uniquely design aims to balance utility and consistency with a playful sensibility and aesthetic to reduce stigma and encourage belonging.

Keywords: Pill Box, App Design, Emotional Design

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Chapter 1 Introduction

Section 1.1 Research Background

Over the past two to three decades, the prevalence of chronic diseases in the Chinese population has shown a trend of first decreasing and then increasing, from 16.98% in 1993 to 12.33% in 2003, and then increasing to 34.29% in 2018, due to various factors such as the age structure of the population, lifestyle and environment. In terms of factor decomposition, the contribution of aging factors to chronic diseases from 1993-2018 was about 64.1%, and the contribution of non-aging factors was about 35.9% (Zheng, Han, & LYU, 2022). According to the Report on Nutrition and Chronic Diseases in China (2020), deaths due to chronic diseases in China accounted for 88.5% of total deaths in 2019, including 80.7% of deaths from cardiovascular and cerebrovascular diseases, cancer, and chronic respiratory diseases; the prevalence of depression in China reached 2.1%, and the prevalence of anxiety disorders was 4.98%, while the prevalence of both depression and anxiety disorders was close to 7% (M. Li, 2020). With the increase in prevalence of these health risks, more and more people are concerned about the prevention and treatment of chronic diseases, and those with chronic diseases are concerned about and want to proactively improve their health status.

Medication adherence is considered an effective measure for chronic disease management, and medication adherence is associated with improved clinical outcomes and reduced mortality from

chronic disease, with medication non-adherence leading to poorer health outcomes and increased health care costs (Zhenxiang Zhang et al., 2022). However, the high number of types of chronic diseases, the long duration of the disease, the inability to cure it, the variety of medications used, and the number of medications taken lead to low medication adherence among patients with chronic diseases (L. Li, 2022). By the end of 2020, about 40% of patients with chronic diseases had multiple medications (taking ≥5 medication types), yet their medication adherence was less than 50%. The management of medication adherence among patients with multiple medications in China's community is characterized by fragmentation and low implementation, and lacks a more comprehensive and scientific management plan to improve medication adherence (Zhou et al., 2022). Most patients with chronic diseases use pill boxes to help them manage their medications to prevent themselves from forgetting to take their pills, overdosing, repeating their medications or taking medicines incorrectly. Therefore, it is especially important for them to choose the right pill box—one which will support them in taking medications appropriately. Most of the pill boxes on the market are designed to focus on lower costs and ease of use, resulting in products which can be used but do not dig deeper in terms of emotional design, appearing to be less aesthetically pleasing and lacking in affinity, and most of them do not effectively reduce the negative emotions of patients when taking their medications, and do not improve the motivation and compliance of patients to take their medications.

1.1.1 Motivations

I, born and living in China, am a patient with depression and anxiety who requires long-term

medication. I have often in the past focused more on innovation in design at the behavioral level, more on how easy the product is to use and the behavioral patterns of the user. In 2022, I took an internship with an automotive company, and they hired me to do design research on car seats. I read and summarized a lot of articles on car seat performance, drew some knowledge tree diagrams, and presented the findings to them. But they were not very satisfied, because they thought that not only performance was worthy of consideration, but also the appearance of the seat could influence people's judgment of its comfort. This inspired me a lot, because I often overlook the impact of styling on the psychology of the target users; it turns out that innovation can be reflected not only in the behavior, but also in the styling of the product. In his book *Design Meets Disability*, Pullin states that "the priority for design for disability has traditionally been to enable, while attracting as little attention as possible" (2009, p.15). Designers have too often designed medical aids as purely functional products, stereotypically assuming that the only thing the patient or person with a disability wants is the end result—recovery—rather than a good experience in wearing or using it. Good design, however, has a balance of process and outcome, and for the user of a medical assistive device the process is as important as the outcome. So, what affects the experience of use? I argue that it is the ease of use and the appearance of the assistive device. Ease of use relates to the user's ease of daily operation; if it is not easy to use, it can be very frustrating and can discourage people from treatment or correction. The appearance of an assistive device affects the patient's or disabled person's judgment of their identity and their confidence and self-esteem in social situations. A good designer is one who empathizes with the user; they are able to put themselves in the user's shoes and take into account their emotions and perceptions.

People who are sick or disabled are often considered vulnerable and disadvantaged in society; good design aims to de-stigmatize them and allows "normal people" to see their uniqueness and strength and realize that we are all born equal, regardless of rank. To this end, I have used the emotional design framework as a primary design research tool in my MRP, and deeply appreciate the central idea of emotional design for the pill box that is essential to my daily life.

Section 1.2 Research Purpose and Meaning

China has more than 260 million people with chronic diseases("Medical and Health Care in China," 2012), of whom more than 180 million are elderly ("Health China Action Promotion Committee Office Press Conference Transcript on July 29, 2019," 2019). Since the majority of patients with chronic diseases are elderly people, most pill box designs in the market and in the academic field focus on elderly people as their primary audience. However, I want to draw the public's attention and understanding to the young and middle-aged people who suffer from chronic diseases, and this has motivated my design of medicine boxes that take into account the preferences of young and middle-aged people. This project applies the emotional design framework to the design of a variety of pillboxes that are intended to meet the habits and preferences of young and middle-aged people.

Section 1.3 Research Method

Auto-ethnography is a research and writing method that aims to describe and systematically analyze (*-graphy*) personal experiences (*auto-*) in order to understand cultural experiences (*-ethno-*)

(Ellis, Adams, & Bochner, 2011). Auto-ethnographic researchers use their own personal experiences as a source of data through which to represent self-subjectivity and express self-awareness in their dual roles as insiders and outsiders. They are both the researcher and the object of research. Auto-ethnography has various forms of expression, including evocative narratives (or personal narratives, as they are called). Evocative narratives, often written in the first person, are designed to "evoke" the readers' empathy for a narrative event, to "stimulate" readers to use what they have learned from reading to reflect on, understand, and make sense of their own lives; to provide lessons for subsequent conversations, instead of drawing irrefutable conclusions (Jiang, 2011).

This MRP uses the evocative narrative approach of auto-ethnography. The approach used is focused on reflecting on my own personal experience and does not involve gathering data or telling stories from others. The focal point of this approach to designing in this project is my autonomy as my own research participant, as a self-aware, reflective, and conscious creator, not as a vulnerable subject. As an insider, I expect to present my lived experience and self-reflection to other insiders or outsiders. I consider my personal experience to be valuable and unique to them. This is similar to artistic creation, where artists who uses autobiographical methods create artworks that are based on reflections and visions of their own lives, which are individual and accountable only to the artist; the same is true for this project, where the final result is based on personal preferences and inferences, which are accountable only to me and do not involve any interest dispute with others.

Chapter 2 Existing Theory and Practice

Section 2.1 Emotional Design

Emotional design was introduced by Norman in his book *Emotional Design: Why We Love (or Hate) Everyday Things*, and is divided into three levels: visceral, behavioral, and reflective, which are based on human emotional needs. The visceral level of design corresponds to people's innate sensory needs (visual, tactile, auditory, etc.) and requires designers to focus on the appearance of the product. The behavioral level of design corresponds to people's needs for good experiences(such as ease of use, comfort, convenience) during the use of the product, and requires designers to focus on the function and interaction of the product**;** the reflective level of design corresponds to the deeper level of people's thoughts and emotions (such as self-image, satisfaction, memory, emotional resonance), requiring designers to pay attention to the personalized characteristics of the product, the special meaning of the product, etc. Norman argues that in real products, real experiences include all three levels and rarely involve only one level (Norman, 2004)**.**

Section 2.2 Smart/Intelligent Pill Box

At present, the research on smart pillboxes is divided into two main directions: firstly, from the perspective of user experience, to fully explore user needs and optimize the user experience of the products, and secondly, from the perspective of technical implementation, to study the technologies to realize the functions of smart pillbox products.

The research results from the perspective of user experience are discussed first. Ruibo Chen conducted a co-design activity among a target group of elderly people to understand their needs and usual experience of using the pill box through a generative toolkit, and finally designed a smart pill box that included three modules of pill cutting, drinking and timer (Chen, 2019). Using Norman's emotional design framework as a guide, Linfei Hou et al. conducted user research using the interview method and researched smart pill boxes in the market to determine the appearance, material, and delivery method of their smart pill box from the three levels of emotional design (Hou, Li, & Gao, 2021). Jinan Xia et al. combined Maslow's hierarchy of needs theory and Norman's emotional design theory as the guiding framework for their study. They used a questionnaire to ask the elderly who use smart pill boxes to rate the existing smart pill boxes to understand the problems of the existing products and improve the design of the smart pill boxes accordingly (Xia, Yang, & Wu, 2016).

Other research results focused on technology implementation. Yuxing Wu and Xiangsen Han developed a smart pill box based on the Arduino microcontroller. The specific chip used in this pill box is Atmega328P, which has an open lid detection module and a timing module, and can be connected to a cell phone app via Wi-fi. It reminds the user to take the medicine on time and detects whether the medicine in the box is decreasing (Wu & Han, 2021). Guoquan Chang et al. designed an IoT-based smart pill box system with STC8 microcontroller as the core, and designed several modules for its feasibility. The user can interact with it by voice and touch, and can monitor the medication usage through Wi-fi or 4G modules(Chang, Shang, & Sun, 2022).

Due to my interest in emotional design and product design, and lack of technical skills in microcontrollers, this study focuses on user experience and proposes some design concepts for the pill box based on emotional design theory through the analysis of my personal narrative and existing products on the market.

Chapter 3 Design Analysis

Section 3.1 Scenario

3.1.1 My Own Story

This scenario has been developed based on my personal experience, using an auto-ethnographic method that aims to situate my design efforts within a familiar and local context. I have mental illnesses that require long-term medication. I use the same type of pill box, which is divided into

Figure 1 My Pill Box (Whole)

seven small boxes as shown in Figures 1 and 2, each of which can be removed individually and has its own lid, which is marked with the corresponding Monday to Sunday logo. The Saturday compartment is designed in orange, contrasting with the other white compartments, adding a little visual effect and making the whole design of the box not dull and unchanging.

Figure 2 A Compartment of My Pill Box

Every Thursday I fill it with a week's dose of pills at once. I lift all the lids and fill the pills one by one. A pill cutter is used, since I take 17.5mg of one of the medicines each day, each box contains one and a half 10mg and half 5mg pills of this medicine. The pill cutter I use is shown in the picture and is divided into two parts: a lid with a blade and a box with a structure to hold the tablets. To use it,

I need to put the tablets on the V-shaped fixing slot and then force the lid to close the box part to cut the medicine in half. The pill cutter I purchased was not of good quality and the lid would always separate from the box when I used it, resulting in not being able to cut the pills; I had to press on the part of the lid that was attached to the box to apply pressure.

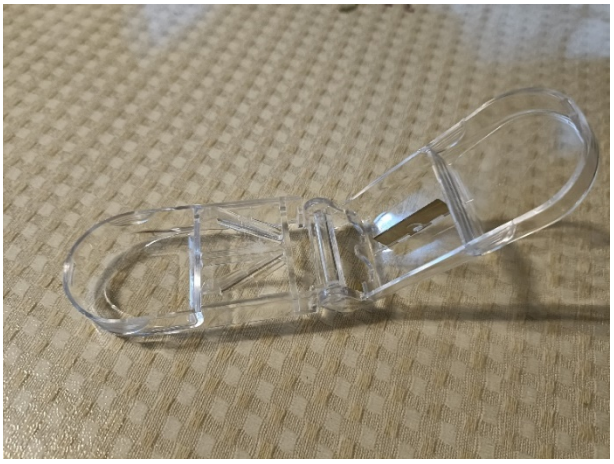

Figure 3 My Pill Cutter

I take a total of three medicines and one nutritional supplement every day, twice a day (in the morning and in the evening). I used to keep the pill box in a prominent place on my dining room table so I wouldn't forget. In the morning, I would take my supplements and one of my medicines, but the box contained a day's supply of each pill, so I had to take the tablets I needed to take individually with my fingers. In the evening, I would pour the remaining tablets in my hand at once and then pour them into my mouth to take them. When I need to go out, I will take the corresponding

pill box for the day separately to carry with me.

My mother once asked me, "Will you still think of yourself as a patient?" My answer was that I think so when I am prescribed and taking medications. I have been suffering from depression and anxiety since 2020 and have recently returned to a mostly "normal" state after treatment, where I can communicate with others and work and study "normally" and basically have no negative thoughts. However, in order to maintain this state, I still have to take medicines every day for a long time. In China, prescription drugs must be prescribed at a hospital. You need to register before seeing a doctor and then sit in the waiting area and wait for your number to be called. Doctors are very busy and have to deal with many patients a day, so they don't spend much time on each patient and don't have much time to listen to patients' thoughts. They always seem a bit perfunctory in their treatment of patients, which makes me feel more like a robot in disrepair than a living, breathing person with self-esteem. In the course of taking my medications, pills remind me over and over

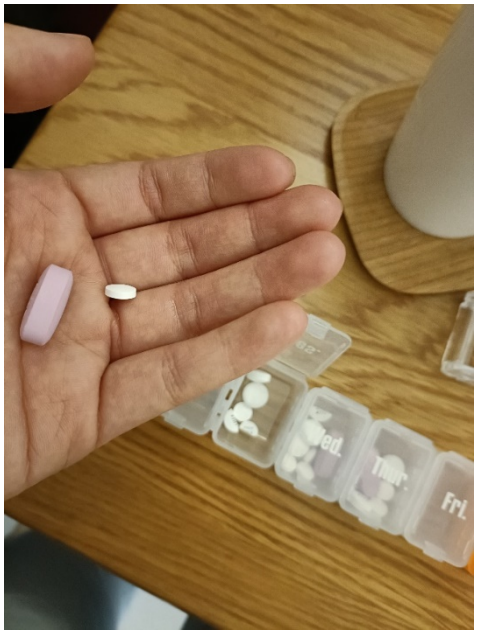

Figure 4 The Way I Take Morning Medicine

again that I am a patient and still need to be treated. My mom often reminds me to take my medication, which annoys and shames me, especially when I have already taken it and am still being reminded. When I go out with friends, even though they know about my condition, I still feel shame and uneasiness when I take out my pill box (my medication needs to be taken with meals) and don't want them to see me taking my medication or ask about my condition.

But now that I look back, so what if I was sick? I could actually recognize that I was a sick person. Part of the reason I feel ashamed of my condition may come from the influence of the society I live in. Although the Chinese government has recognized that discrimination against people with mental illness is a serious social problem and has passed legislation to protect the rights of people with mental illness, it is still difficult for most people in society to see the positive side of people with mental illness. According to statistics, 80% of people with mental illness have experienced discrimination, and about 56% of family members keep their family member's mental illness diagnosis a secret to avoid discrimination. This is related to the reports and publicity of mental illness. Most reports do not intentionally discriminate against people with mental illness, but the portrayal of their behavior creates a negative image of this group. These stereotypical reports make readers believe that mentally ill people can be abnormal or violent, pose a threat to other people and society, and affect social stability (Zhisong Zhang et al., 2019). I also have some negative perceptions of patients in a subconscious way. In my opinion, patients are "dysfunctional" and "defective", and I do not want to be such a person. I believe that both the biased reports and such thought reflect prejudice and bullying of patients from the perspective of able-bodied people. The

fact that I, as a member of the mentally ill, also think this way, and that I am not the only one to think this way, reflects the internalization of discrimination by the patient community, i.e., the unconscious recognition and acceptance of discrimination. This phenomenon shows that China still has a long way to go to destigmatize the chronically ill.

3.1.2 Mad Pride

In western countries, there is a growing body of work documenting the effort to reappropriate negative stereotypes of mental illness as markers of identity and pride. Shrader, Jones and Shattell define this as the “consumer/survivor/ex-patient (c/s/x) movement,” which has “influenced mental health services and human rights discourse for several decades” through criticism of the medical model as well as developing a culture of madness (2013, p.62). Like the self-expression of joy and identity at Pride parade events held by the LGBTQ+ community, effort to construct a positive identity and cultural movement is known as Mad Pride. Rowland states that Mad Pride movement is arguing against and at the same time reinforcing the artificial binary between the sane and insane which is created by psychiatry and the medicalization of mental states, and the mad groups are hard to unify themselves because “there is no uniting characteristic of the mentally ill other than the experience of mental distress” (2015, p.2). In other words, the definition of “mad” comes from sane people, however, mad people would like to be equal to the sane in social status as an independent and positive identity, and at the same time to use the mad concept to be distinguish with them, without jumping out from the frame used to oppress the mad groups. To step forward, Beresford believes that the mad groups need to “support the development of diverse non-medicalized individual and

collective survivor narratives to counter dominant psych-based ones” and use those terms that have used to oppress the groups (2020, p.1341).

As I mentioned above, people with mental illnesses in Asian countries continue to be the object of discrimination, bearing the monopoly of the hospital's assertion of their madness and the psychiatrist's discourse on madness. They struggle with the psychiatrist's diagnosis that they are "abnormal" and "need to be corrected" and suffer from the daily medication they take to maintain their "normal" status in the secular view. But few people in this society really stand up for them and speak out on their behalf. I think Asian countries should consider the new possibility that maybe mad people can become a culturally significant socio-political group like LGBTQ+, after all, the mad community has its own spectrum. For example, mentally ill people with hearing disorders may be seen as gifted and uniqueness. Just as Van Gogh, who was mentally ill, was able to paint a different kind of painting than an able-bodied person and even surpassed their works in artistic value, ultimately representing an early example of disability aesthetics in visual art (Solvang, 2018). People are diverse, and there is not just one way to live. People have both "normal" and "abnormal" freedoms.

3.1.3 Medication Workflow and Emotional Factors

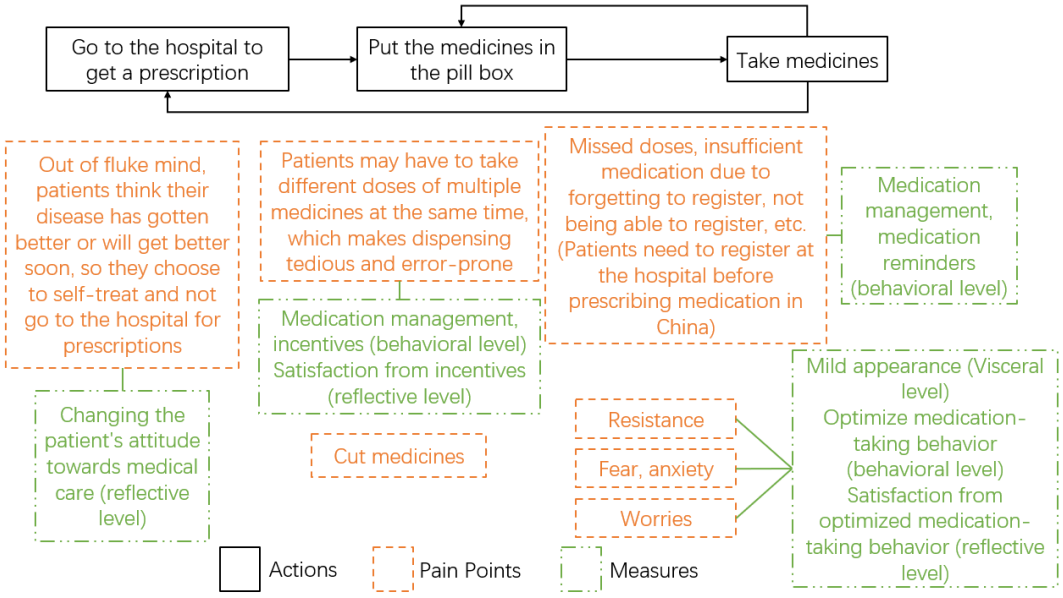

Figure 5 Scenario Analysis Graphic 1

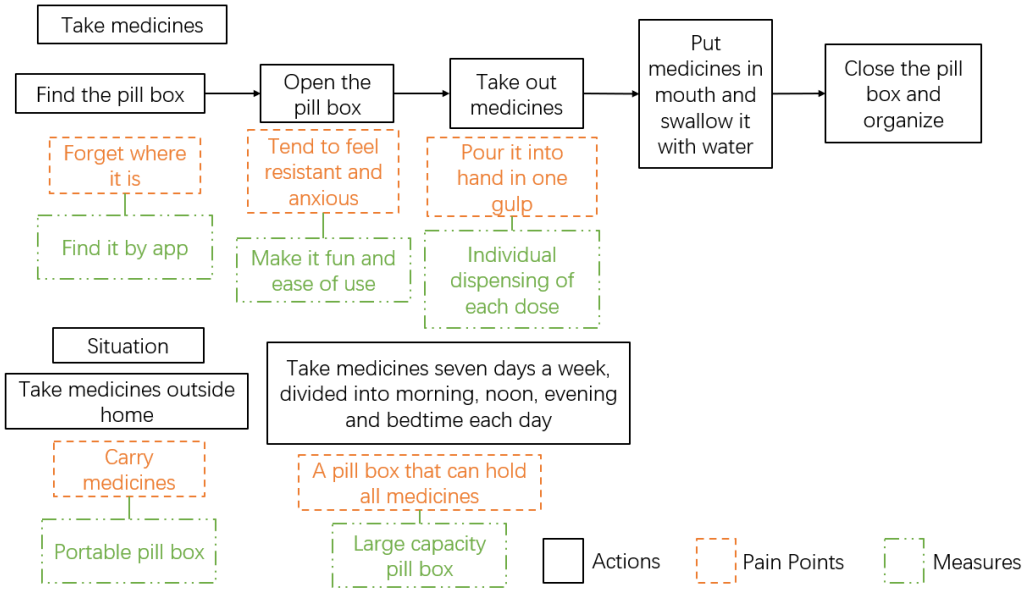

Figure 6 Scenario Analysis Graphic 2

Figures 5 and 6 are the scenario analysis graphics based on my personal experience as described

above. The black boxes represent actions, the yellow boxes are pain points, and the green boxes are measures. This graphic depicts the negative emotions and problems I may have experienced during treatment and medication.

3.1.4 Contributions

So, what does this tell us about the design of the pill box? In an East Asian society that is "afraid of weakness" and "admiring of strength", patients inevitably feel the "gaze from the able-bodied". Are there any designs that can alleviate patients' anxiety and stigma? The design of the pill box can be interesting and fashionable, so that it can divert the attention of others from the patient's condition to the pill box itself when the patient takes out the pill box in front of them; it can also make the patient pay more attention to the fun or fashionable appearance and operation of the pill box, thus weakening their attention to the medicine itself and relieving their bad feelings about taking the medicine. In addition, the pill box can be designed in such a way that it can be used by patients to declare their identity or emotions, so that patients can feel confident rather than ashamed of their identity.

Section 3.2 Competitive Products Analysis

In this section, I compare several pill boxes from Taobao and Little Red Book and use the emotional design framework to analyze competitive products at the visceral, behavioral and reflective levels, with the intention of identifying more and less successful approaches, gaining inspiration from them and preparing for my own design of pill boxes.

3.2.1 Magnet Pill Box

The first pill box consists of a white casing and seven pill boxes. It has a magnetic backing attached to the casing, so that the user can attach the casing with the pill boxes to any iron surface, such as the surface of a refrigerator. Each pill box represents a day of the week and is divided into four small compartments for morning, noon, night and bedtime. When the user needs to take medicine, they can pull out the bottom pill box, slide the top cover left or right to open the pill box and take out the medicines. After taking the day's medication, the user needs to put a new day's medication into the box and insert this box from the top of the casing to complete the refill. On the visceral level, the design of this pill box is relatively simple and unobtrusive; it cannot dramatically alleviate the negative emotions of taking medication. The overall white color evokes a sense of medical care and cleanliness. The logo on the top about the days of the week is clear at a glance, where Saturday and Sunday are different from the black color of weekdays, and are represented by green and red respectively, adding a touch of variation, but I think the use of red should be more cautious - as it could lead to emotional tension for the user. In terms of the behavioral level, it has several advantages and disadvantages. The first advantage is that it can be attached to any conspicuous iron surface, reminding the user to take their medication by its presence; the second advantage is that it meets both the need for a large capacity to hold a week's dose of medication and the need for portability, as each pill box can be removed and carried separately. The first disadvantage is that the patient cannot put the pill box back into its original position after taking it out, but can only place it somewhere else or at the top of all the pill boxes, and placing it somewhere else may cause

the patient to forget to take the medication - because it is out of a conspicuous position. The second disadvantage is that the patient needs to refill the corresponding box every day after completing the medication. The third disadvantage is related to its quality, which I read in the review section of this product, that the magnetic backing on the casing tends to fall off and there is resistance between the casing and the boxes, which can get stuck every time the boxes are removed and placed. On the reflective level, this product, does not evoke any deeper thoughts and emotions, is unlikely to create good memories and bring excellent service, and apparently carries no special meaning—it is only functional and just meets basic, daily use needs.

3.2.2 Lock & Lock Pill Box

The second pill box comes from the famous manufacturer of sealed containers, Lock & Lock. It consists of seven small pill boxes of different colors and a white casing, each divided into four compartments: morning, noon, night and bedtime, each with a separate lid. The whole is wrapped in a white casing with a rectangle in the middle of the side to allow the user to see the arrangement of the pill boxes inside. In terms of usage, it is the same as the first pill box except that it cannot be attached to any surface. On the visceral level, the seven pill boxes are designed in the colors of the rainbow to attract consumers' attention. The overall rounded lines and oval design give people a sense of affinity compared with the rectangular shape. On the behavioral level, its merits and problems are similar to the first pill box; however, its quality is better than the first pill box, and the user can take out and put in the pill box more smoothly. On the reflective level, it comes from the famous manufacturer, Lock & Lock, and its good quality and service can bring a sense of

satisfaction to users. The rainbow color scheme may also relieve customers' negative emotions when taking pills, and it looks like a beautiful decoration at home.

3.2.3 PILBOX Pill Box

The brand name of the third pill box is PILBOX, a French brand. The whole design is available in a variety of colors. It consists of a bag made of leather (with magnets) and seven small plastic pill boxes, each divided into three compartments, with a left and right push-pull lid. On the visceral level, the bright colors and the leather cover of the box make it very attractive and can catch the eye of the consumer. On the behavioral level, the pill box can meet the user's daily medication needs, and the independent design of several small pill boxes is convenient for patients to carry around. On the reflective level, leather brings a sense of luxury and premium to the user, so that people are no longer afraid to take out the pill box and take medicine in front of others, and can even proudly show and recommend this pill box to others.

3.2.4 Pen-like Pill Box

The fourth pill box differs from the PILBOX in that each small pill box is designed in the shape of a pen with a pen clip that can be attached to a chest pocket or other location. On the visceral level, the pen shape is refreshing, and the blue and white color scheme is reminiscent of the blue sky and white clouds, which attracts the attention of consumers and gets them to love it. On the behavioral level, it can be secured in a variety of pockets and doesn't look like a "normal pill box" in a way that other pill boxes can't. However, in practice this may not be as necessary— after all,

not all clothes have chest pockets. On the reflective level, it offers the user a new way of thinking - rather than hiding it elsewhere on the body, make it visible and stick it in the chest pocket along with the pen; this could lead to a different experience and even demonstrate an identity.

3.2.5 MEMOBOX Pill Box

Finally, there is a smart pill box called MEMOBOX. It consists of a white outer box and a transparent inner container, which can be replaced by the user as needed. The outer box is powered by button batteries and can be connected to an app on the phone via Bluetooth. The patient can set the time to take the medication on the app. When it's time to take the medication, the reminder light and buzzer on the box will be triggered and the app will send a reminder to remind the patient to take the medication. On the visceral level, it has a simple and elegant appearance, with white color giving a pure feeling and a few other color highlights adding a little variation to the design. On the behavioral level, it can remind users to take their medication on time, which is different from normal pill boxes; when users cannot find the pill box, they can also find it by triggering the light and buzzer of the pill box through the app; however, there are also comments that the sound of the buzzer is too small, making the reminder function of this pill box rather weak; in addition, the capacity of this pill box is limited and not portable enough. On the reflective level, this is only a design that meets the basic needs and does not provide meaningful memories and meet any emotional needs.

Section 3.3 Brainstorming

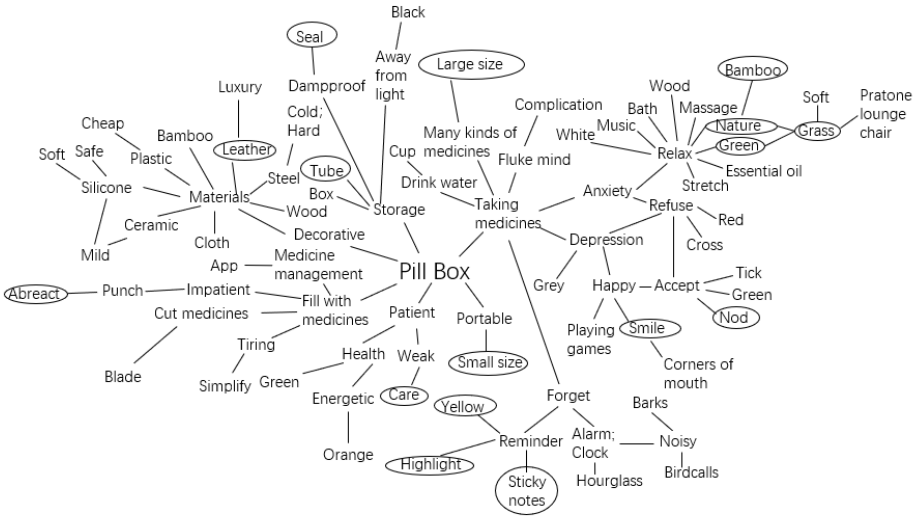

Figure 7 Brainstorming of Pill Box

Based on my personal understanding of pill boxes, I created a mind map to visualize different characteristics of a pill box design and their relationships to each other, as shown in Figure 7. The image shows keywords related to pill boxes with circled potential design opportunity points, including size, nature, green, bamboo, etc.

Section 3.4 Design Considerations

Visceral level: Mild appearances, materials and colors.

Behavioral level:

1. Medication reminders;
2. Incentives;
3. Optimization of the medication taking process to enhance fun and ease of use;
4. Containers capable of holding medications;

5. Moisture resistance;

6. Portability.

Reflective level:

1. Changing patients' attitudes towards access to care and increasing their motivation to seek care.

2. Giving patients a sense of satisfaction and accomplishment through incentives.

Chapter 4 Design Concept

Section 4.1 The Pill Box Design

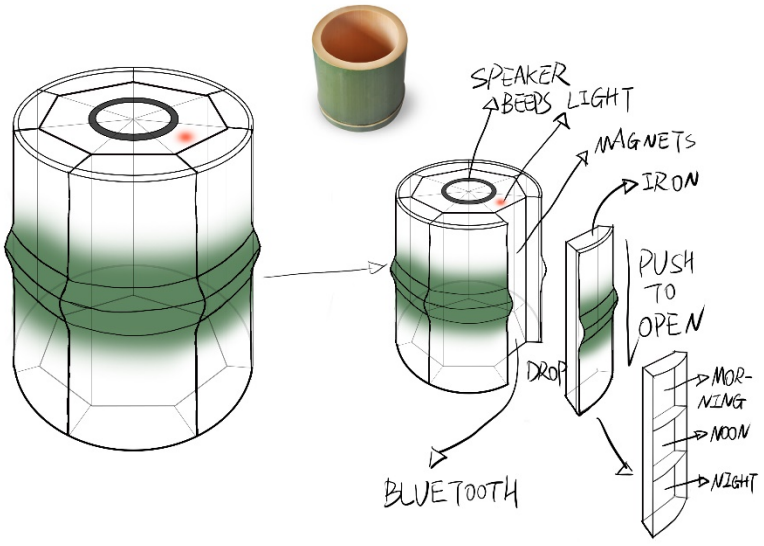

Figure 8 The Sketch of Bamboo Pill Box

Inspired by bamboo tubes, this pill box contains two parts, a timer and seven boxes. The timer is made of white plastic; the boxes are made of iron, with an overall white painted outer layer and

green accents in the center. There is a ring-shaped speaker at the top of the timer, which will beep when the set time is reached. In addition to the speaker, there are also seven LED lights, corresponding to the seven boxes. The corresponding light will light up individually each day. The light will keep flashing when the set time is reached to remind the user to take the medicine. The timer is equipped with electromagnetic relays inside to attract the iron box. When the set time is reached, the electromagnetic relay in the corresponding direction will be disconnected and the corresponding box will fall down. The timer can be connected to the app on a cell phone via Bluetooth, and the user can set the time to take the medicine through the app. The lid of the iron box is push-pull type, and the box is divided into three compartments, corresponding to the morning, midday and evening of each day. When it is time to take the medicine, the user needs to open the dropped box to take the medicine, and then re-hang it on the timer. When this is done, the timer will stop flashing and beeping until the next pre-set time to take the medicine is reached.

Section 4.2 The App Design

In order to provide a relaxing vibe and alleviate the negative emotions associated with taking medication, the color scheme of the app uses a fresh yellow-green gradient. The interface for binding the pill box is shown in Figure 9, showing a sketch of the pill box and the binding button.

After binding the pill box, the app is divided into three parts: reminder, record and account. Next, I will introduce the features of the app in these three parts.

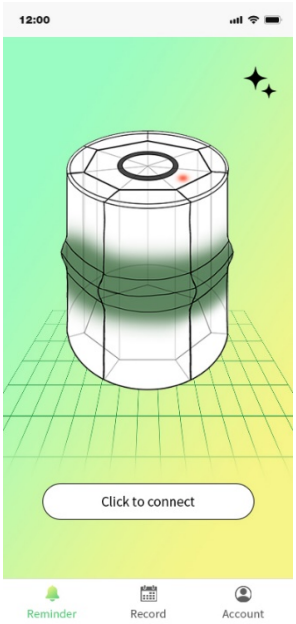

Figure 9 The Binding Interface

4.2.1 Reminder

The Reminder interface will appear after you have bound the pill box, as shown in Figure 10.

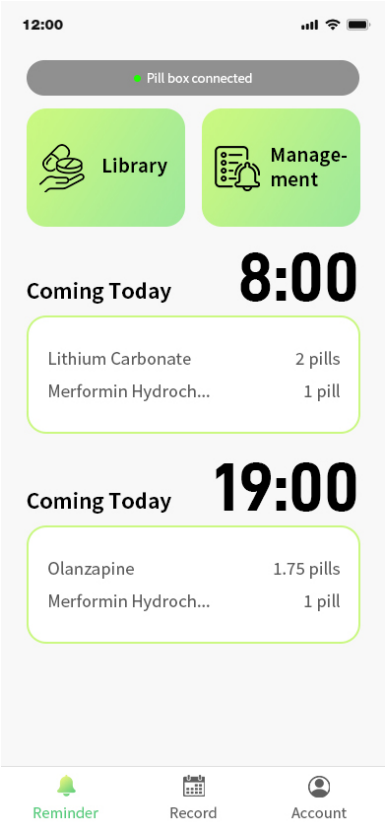

Figure 10 The Reminder Interface

The two major functions in Reminder are Library and Management, as shown in Figure 11, where

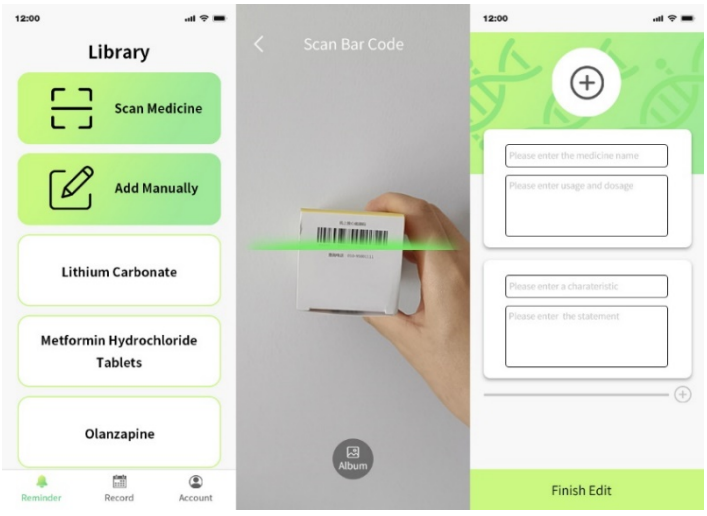

Figure 11 Add Medicine Interfaces

users can add medicines manually or by scanning the barcode, and view the medicines already added. On the page of manually adding medicines, users can change the medicine pictures, medication guidelines and property descriptions, etc., and then jump to the medicine introduction page after editing. As shown in Figure 12, on the medicine profile page, users can click the Edit button in the upper right corner to change the information about the medicine. Clicking on the bottom button jumps to the Reminder Setting page, where users can set the time, dose and frequency of medication reminders in the form of an alarm clock. After clicking Management, users

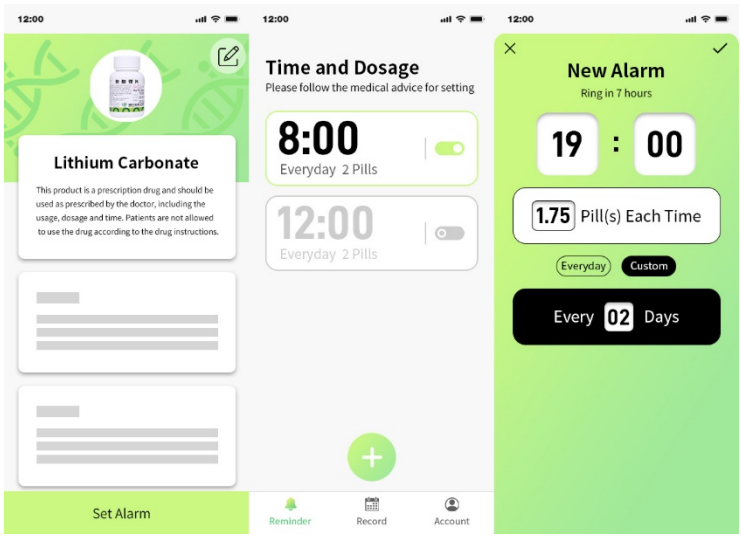

Figure 12 Set Alarm Interfaces

can see the status of each pill box: red means the pill box is empty and needs to be refilled; green means the pill box still contains medications. Users can refill or empty the medication individually by clicking the button of the corresponding medication box, or add or empty all the medication boxes with one click by clicking "One-click Add or Remove". When the user needs to go out, they can click the "Go Out" button. Once clicked, the pill box will only remind the user to take the medication at the set time through the app. The bamboo pill box consists of two parts, the boxes

and the timer. The lights and the buzzer are carried on the timer. Since the user no longer staying at home with the timer when they go out, there is no reason to activate any physical reminder—and this makes the design more discreet in public environments.

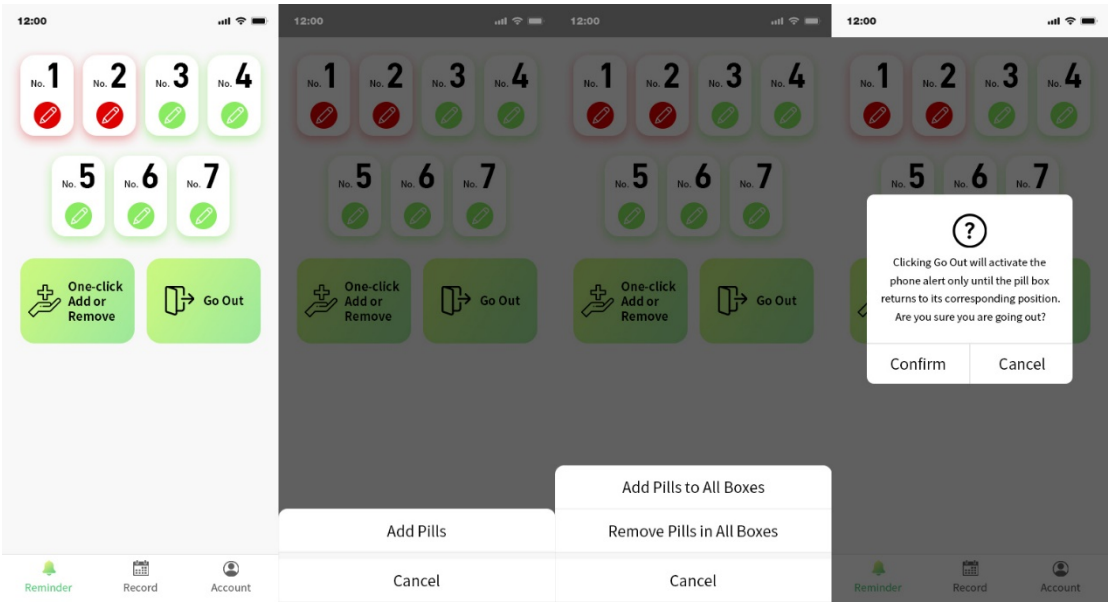

Figure 13 Pill Boxes Setting Interfaces

4.2.2 Record

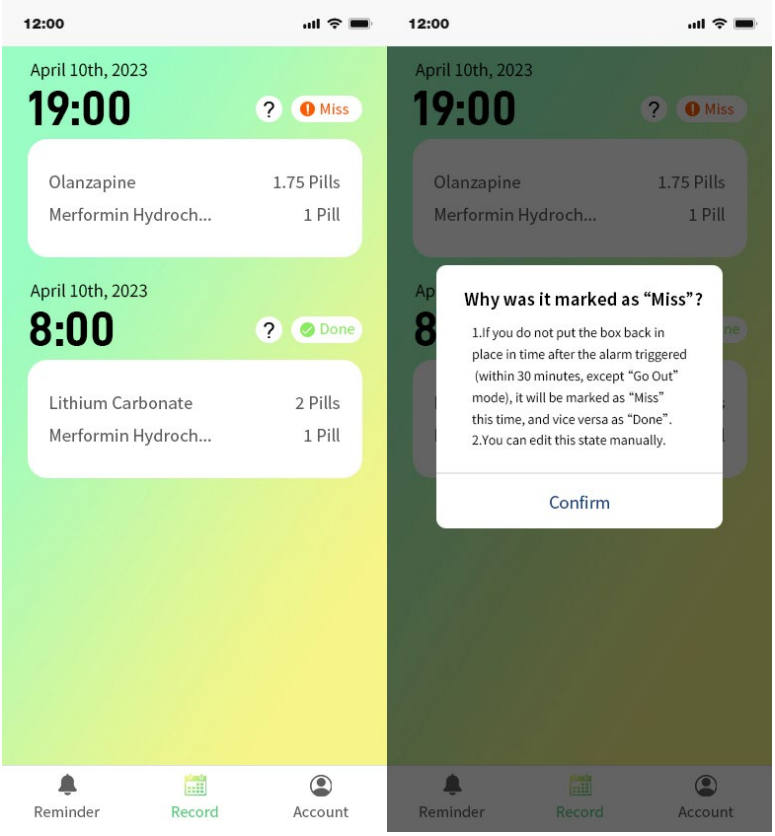

Figure 14 The Record Interfaces

In the record interface, users can view the record of whether or not medication was taken. The top right corner of each record shows the status of the medication, and it will show "Done" if the medication has been taken within the specified time and the box has been put back in its place (if you have clicked "Go Out", you do not need to put the box back in its place, just confirm in the app that the medication has been taken or not). On the contrary, it will show "Miss". Click on the question mark icon to view instructions on how to use this screen.

4.2.3 Account

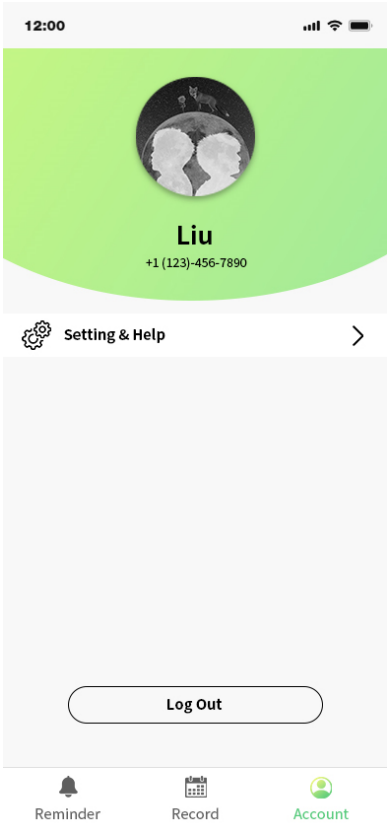

Figure 15 The Account Interface

In the Account screen, users can view account information (avatar and cell phone number), log out of the account, or view pillbox settings and instructions for use.

Chapter 5 Discussion

Section 5.1 Contribute to Emotional Design

In this section, I will analyze the design of the pill box and app proposed in this MRP using the framework of emotional design. At the visceral level, the pill box is designed in the shape of a bamboo tube, with a white body and green accents, and the app with a yellow-green gradient as

the main color scheme, giving people a sense of affinity. The shape of the bamboo tube makes people want to hang the dropped pill box to keep the overall shape intact, which is in line with human's operation instinct (people unconsciously try to keep things as a whole), and encourages and reminds patients to take their medication. The app interface is clear, stylish and beautiful, which may appeal to the aesthetic concerns of young and middle-aged people. At the behavioral level, the pill box and app are easy to operate, have low learning costs, and can effectively remind users to take their medication. The operation of the pill box is unique and interesting, and can provide users with a pleasant experience of using it. On the reflective level, such pill box and app can provide owners with fond memories of using them, and their stylish novelty and beautiful appearance can make owners not only use them, but also not be shy about sharing and showing them to others.

Section 5.2 Aesthetics in Culture

Bamboo has a rich symbolic meaning in traditional Chinese culture. The appearance of bamboo is elegant and beautiful (tall and straight), has the grace of gentleman; bamboo is hollow, symbolizing modesty; bamboo's characteristics of bending but not breaking, symbolizing the principle of softness and strength; bamboo can still stand bravely in winter, in wind and snow, symbolizing the character of perseverance; born with joints, is considered a symbol of integrity. In addition, bamboo forest often became the place where ancient literati, who had encountered political disillusionment and had lived a lonely life, lived in seclusion. They used the bamboo forest to express a sense of wild and unrestrained, keeping distance from the outside world, not yielding to the vulgar and

unchaste posture. I designed the pill box in the form of a bamboo tube to express my wish that people who need to take medication for a long time, especially those with mental problems, like me, will have the same perseverance as bamboo. As I said above, the mad group is subject to discrimination and correction from able-bodied people, especially in China. To some extent, this shows the discouragement of letting our identity be admitted, i.e., not being recognized as a culturally significant socio-political minority. But I believe we can eventually live for ourselves and cherish our uniqueness like the ancient Chinese literati who did not succumb to the outside world; we can be as resilient as the bamboo and not stoop to discrimination.

Section 5.3 Limitation of the MRP

The limitation of this MRP is that it only provides the researcher's own perspective and may assume the thoughts and preferences of others with some degree of bias. The researcher's design may not meet the needs and preferences of all members of the target group, as it is based only on personal preferences and subjective interpretations of others. There is no actual evidence to support whether the bamboo shape and green-white color scheme of the pill box and the yellow-green gradient color scheme of the app can reduce the negative emotions of taking medication. The way the pill box and app are used has not been tested, and there may be inconveniences in actual operation. However, these are also the strength of this MRP project, since it is based on my real lived experience and may be resonant with others who share similar concerns and needs as me.

Section 5.4 Next steps and future work

As mentioned above, the design comes from my subjective understanding and aesthetics, and may deviate from the actual situation of the target group, so if the design proposed in this MRP is to be implemented, the next step will be to conduct prototype testing session or co-design groups among the target group to understand their actual needs and aesthetic preferences, iterate and update the design, solve any problems that may arise in its use, and make it better.

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