Research on the design of intelligent cognitive training products for the elderly

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Abstract. The purpose of this article is to design and study the smart cognitive training products for the elderly. This paper mainly studies how to prevent and improve the cognitive decline of the elderly in the market, analyzes the current situation and problems of the products in the market, studies the needs of users, finds out the functional needs, emotional needs and interactive experience needs of users, and further designs the intelligent cognitive training which is helpful to the cognitive training of the elderly according to the research result.

1. Introduction

With the development of science and technology, smart products have slowly replaced traditional products in our lives. Smart products have a better sense of experience and can also meet the needs of different users. Smart medical products are also slowly entering people's lives. Among them, the smart cognitive training products studied in this paper have high technical levels, diverse operation modes, and unlimited use scenarios. This is a new trend in the design of cognitive intervention training products and provides designers with new thinking directions for related product design. Therefore, it is necessary to analyze the existing intelligent cognitive training products and discover the problems in product design, so as to conduct intelligent cognitive training product design research.

2. Demand for elderly cognitive training products

The elderly group is a very important social group, how to successfully age has become a major issue of concern to society and academia. Alzheimer's disease is a major threat to the health of elderly people[1]. There is currently no disease correction therapy, but treatments to improve symptoms are feasible. Cognitive decline is the earliest clinical symptom of Alzheimer's patients. If early detection can be achieved early in the disease, effective intervention measures can effectively delay the disease[2]. A large number of cognitive aging groups will generate a huge demand for cognitive training products. Therefore, many cognitive training products have appeared on the market. Cognitive training can promote the plastic repair of the central nervous system and improve patients' cognitive function and life ability. While traditional cognitive training products can no longer meet the needs of users, intelligent cognitive training products are slowly beginning to appear in the public's field of vision.

3. Status quo of intelligent cognitive products for the elderly

Through network research and field research, it is found that there are many ways of cognitive training. The early cognitive rehabilitation training mode is to provide cognitive training of different degrees of
difficulty according to the patient's condition in a positive environment, including attention, memory, and orientation [3]. Such cognitive training is shown in Table 1.

Table 1. Types and methods of cognitive training (Author's translation)

| Name                  | Specific method                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| Intensive memory      | A. figure recognition method, B. information repeated recall method, C. picture and text combined memory method |
| Time concept training | Re-plan the patient's rest time (what time do what) according to the situation, strengthen the patient's concept of time |
| Language training     | A. thing retelling training (making tasks, such as reading a book to retell the content), B. reading pictures training, C. reading ancient poetry training |
| Computational ability training | Train patients' calculation skills, simple arithmetic problems, including daily account training |
| Attention training    | A. Guess boxing game, B. Music appreciation, C. Find different games, D. Planting flowers and plants can not only cultivate sentiment but also improve concentration |
| Inference strategy training | Looking for patterns in text, looking for patterns between numbers, etc. |

According to research, domestic products on cognitive training are extremely rare. Relevant equipment is generally based on cognitive assessment, and is mostly used in large hospitals. These products are expensive to build and bulky, and are generally integrated with desktop computers and printers. This product is generally designed for patients with multiple bells and has a large age span. It is inconvenient to operate and lacks pertinence. Due to the high cost, elderly patients can only be evaluated in hospitals, and the elderly live at home most of the time. It is difficult to satisfy the elderly with sufficient cognitive exercise, leading to delay and aggravation of the disease[4]. The following are some typical intelligent cognitive products studied in this article:

3.1. "Recall the grip"

The first is "Recall the Grip", a photo browsing product (figure 1, figure 2), which is designed based on the intensive memory training in cognitive training. Implanted nostalgic therapy for memory impairment to wake up memory, the purpose is to help patients Through external stimulation to slow down the deterioration of the disease, the product has been put into practical use. The realization of nostalgia therapy is to add the function of playing photos, to achieve the effect of awakening or strengthening the memory of patients by viewing the photos, and adding nostalgic elements or elements and functions to stimulate memory in the product design process to strengthen the memory of patients. Early identification of the elderly with amnestic mild cognitive impairment and timely targeted intervention can effectively reduce the incidence of dementia.

The main color of this product is a blue cylinder. "Circle" is a love that the Chinese nation has always loved. It is simple and complex, symbolizing reunion and perfection. Most Alzheimer's patients are willing to accept products that meet these styling characteristics. In terms of product color, the visual ability of Alzheimer's disease is usually weak. For a single color, Alzheimer's patients prefer the medium brightness group, where the color looks more beautiful. The product uses a dark blue with
medium brightness, which is more easily accepted by the elderly. In terms of color, bright colors have strong visual impact and relaxed visual effects. Alzheimer's patients are usually more attracted to such colors, so buttons generally use bright colors.

The patient realizes the function of playing photos by holding the product with both hands, and also exercises the patient's hand when using it. The view of traditional Chinese medicine in China believes that the hand has many points, and the movement of the hand can continuously stimulate the brain, thereby delaying the process of brain decline[5]. Memories therapy also increases positive social interaction and mental health. Patients can watch with family members when using them, which increases emotional communication with family members. When the patient is using the product, it is also a process of interacting with the product. This way is a user-centered interaction design. The main symptoms of this product are mild to moderate cognitive impairment.

3.2. Tips for good habits

The second product is an electronic reminder called "tips for good habits" (Figure 4 and Figure 5). This product won the design rookie award at the 2018 Samsung Design Award by IF Smart Care and became announced on the IF official website One of 17 products. This product has a good reminder function, which can effectively avoid the patient's forgetting and strengthen memory to stimulate cognition, while achieving self-care while giving the patient positive stimulation, effectively delaying the rate of brain degradation. The bottom of this electronic reminder is made of a new type of adhesive material. The surface is divided into three layers from the outside to the inside: the outermost layer is the touch chute adjustment time layer, the second layer is the remaining time display ring, and the third layer is the set time display floor. It can be attached to the surface of various products at will. The user only needs to set the time through the touch ring and attach it to the product that needs prompting. The prompting sticker will make a pleasant sound at the preset time to remind the user to interact with corresponding products to help users develop good habits. This is a very simple product with a simple structure, easy operation, and interactive concept products with multiple health (and other) applications.

The overall shape is round, which gives people a sense of roundness and harmony. The round shape is a shape with a sense of security and gives the patient a sense of intimacy. Using eye-catching orange, for Alzheimer's patients, color stimulation can have a positive effect on the brain, and bright orange can help relieve the psychological pressure of patients[6]. Adopt an interactive form, paste the product on the item that needs to be reminded, and set the time to be reminded by touching the chute layer. When the time is up, the reminder will emit a pleasant music sound to call the user and remind the user to interact with the predetermined product. This product is highly interactive and easy to operate. The main symptom of adaptation is mild cognitive impairment.

3.3. Reactive coordination trainer

Reactive coordinated training device (figure 5), an auxiliary tool for upper limb flexibility and coordinated training, improves the upper limb's daily activity ability and response ability. While training, it not only improves the elder's response coordination ability and upper limb flexibility, but also it can attract the training interest of the elders, enable the elders to maintain longer training time...
in an independent space, and reduce the cost of nursing care time planning. Step-by-step response stimulation training not only does not make the folds feel boring, but also stimulates the elders to be immersed in the success of sports game training, reducing the emotional instability and mania caused by the depression and frustration of the elders.

The shape is simple, there are not too many buttons and decorations on the entire desktop, which is convenient for patients to operate and use. The training area is a large circle composed of four colors of circular buttons evenly divided. The color is bright and the reaction speed can be adjusted by the user. It is easy to change from difficulty to training in order to form a good human-computer interaction, which improves the user experience, but does not require a reaction training game with excessive brain activity. Because the product can adjust the degree of difficulty, the main symptoms of adaptation are mild and moderate cognitive impairment.

3.4. Some Common Mistakes

- The three products analyzed above are more interactive, and the products designed by human-computer interaction are more easily accepted by patients. Therefore, when designing products, some new forms can be used to design, to innovate how Alzheimer's patients interact with the product, can be interactive innovations on the action limbs, or visual, auditory, touch, from multiple angles Designing multi-dimensional puzzle games in harmony with the aspect[7], so that people have more choices and more targeted for Alzheimer's disease.

- These three products are designed for a combination of different methods of cognitive training, so when designing products, you need to consider designing some clever methods to improve patient acceptance, and can be used independently by patients at different stages.

- In designing the shape of the product, all three products use a round element. The round shape is a shape with a sense of security and gives the patient a sense of intimacy, but the straight line makes the console look simple and easy to use. The shape should be considered when designing Psychological feelings of Alzheimer's patients[7].

- As far as product color is concerned, the three products analyzed use a single color, and a bright color reminder is used at the button. The visual ability of Alzheimer's disease is usually weak, so the auxiliary functions of the human-machine interface need to be simple and easy to understand, Safe and reliable, to meet their daily needs.

4. Research on Intelligent Cognitive Training Design

This intelligent cognitive product mainly combines the puzzle jigsaw puzzle in the cognitive training method with the product. Studies have shown that educational toys have a great influence on the intelligence maintenance of the elderly because hand movements account for 40% of brain cell Part of the movement can continuously stimulate the brain, thereby delaying the decline of the brain. Therefore, the elderly need to strengthen their hand movements, and can do more activities such as calligraphy and practice, playing the piano, and doing finger exercises to prevent Alzheimer's disease.

The jigsaw puzzle combines the three trainings of inference strategy training, attention training, and enhanced memory training, and increases the fun in the use process to avoid The user's repulsive
psychology attracts users to take the initiative to use the modular electronic screen and Huarong Road to realize the puzzle function. It can be placed in the public entertainment area of the community, allowing the user to have an unlimited range, allowing the patient to go out of the house to communicate more with others, and also to improve their cognitive decline. The elderly can also use this product to slow down It can even prevent the decline of cognitive ability, and even help the mental recovery of mild dementia patients to a certain extent. In the game, the elderly are guided by the hands to use different hand postures to achieve the purpose of hand exercise. This is a new community intelligent recognition Know training products (figure 6). Designed and modeled by the author himself.

Users can start to record their own use by scanning the QR code before use, and can choose the difficulty of the game, and choose the game according to their own situation. The application of modular electronic screen, through the "well" shaped track, to achieve the combination of products can be pushed; The use of the control shaft is combined with hand cognitive training. By changing the shape of the control shaft, the posture of the hand is changed to carry out hand cognitive training; The telescopic baffle is equipped with a raindrop sensor. When the sensor senses that raindrops fall on it, the baffle will automatically extend to prevent damage to the machine from rain and snow.

The product is mainly divided into display module and control module. The display modules are actually small LED driver boards of the same size, capable of driving LED arrays, have basic display functions, and can accept data and commands from the control module. The control module is responsible for controlling each display module and sending data and commands to each display module. The electronic screen of each module can be reorganized according to the track.
The overall shape is simple, the straight line makes the console look simple and easy to use, there are only three buttons on the screen, and the colors are eye-catching, respectively green, yellow, red, and the handle also serves as a reminder of red. Combining design services with medicine to effectively realize the product can delay the improvement of cognitive decline. The puzzle picture is designed according to the type, area, and brightness of the color. It is easy to design the picture. Therefore, the main symptoms for adaptation are mild and moderate recognition.

5. Development trends of cognitive training products for the elderly

- First, affected by factors such as geography, economy, culture, and society, most grassroots communities lack rehabilitation conditions to improve cognitive dysfunction in patients with early dementia. Products that improve cognitive impairment should be promoted and applied at the grassroots level. Depending on the place of retirement and the way of living, the family can be regarded as the scene where the cognitive aging population receives the most cognitive stimulation. The designer can start from this angle to develop a cognitive training product suitable for use in the family environment. The focus gradually shifts to the family or the community in which it lives;

- Second, according to the concept of human-computer interaction, human-computer interaction requires two-way communication. With the development of Internet technology, the voice interaction system has become the most direct interaction method. Therefore, when designing intelligent cognitive training products, in the case of physical inconvenience, the complexity of interface operations is alleviated through voice interaction. Voice interaction can use voice control to reduce the complexity of interface operations, including voice input, voice recognition, and voice control[8];

- In order to better meet the needs of users, it is an inevitable trend to subdivide the categories of people with cognitive decline. In contrast, cognitive training products also need to be subdivided. Through the design of knowledge training methods, these cognitive training methods and intelligent products are combine to design products suitable for people with cognitive impairment at different stages.

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