

Research on Office Pillow Design Based on Multi-Sensory Interaction

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Abstract:

With the accelerated pace of people's lives and work, the workload of the office workers is getting bigger and bigger, the time spent in the office is getting longer and longer, and the physical and mental health problems of the office workers are becoming more and more prominent. This topic investigates and studies the common problems and pain points of office workers, as well as tries to improve existing products through interaction design, and strive to improve the health risks of office workers and provide valuable reference and basis for the majority of office supplies designers.

Keywords:

Multi-Sensory, Interaction Design, Office Supplies, Emotional Design, Experience-Driven Design, Product Design, Sensory Modality

1. Introduction

In 2012, American scientist EG Wilmot published the article "Sedentary time in adults and the association with diabetes, cardiovascular disease and death: systematic review and meta-analysis" in *Diabetologia*. This study pointed out that people who are sedentary will increase the risk of diabetes by 112%, while increasing the risk of cardiovascular disease including heart disease by 147% and increasing the probability of death from cardiovascular problems by 90% after investigating nearly 800,000 people [1]. In the globe health risk report, the World Health Organization pointed out that "sedentary" is the fourth most common risk of death after high blood pressure, smoking, and high blood sugar, causing 3.2 million deaths each year [2]. In addition, increases the risk of cancer in women, including multiple myeloma, ovarian cancer and breast cancer [3]. Sedentary will make a person's digestive function decline, causing constipation, loss of appetite, abdominal distension and other issues, and these problems will further cause obesity and other diseases. It is easy to cause a decrease in immunity and a decrease in resistance. Sedentary can cause insufficient blood supply to the brain, which can cause poor memory, mental fatigue, and even affect the central nervous system, which will affect the mood. In order to pursue learning, work, economic efficiency in today's increasingly fierce competition, some enterprises, institutions or individuals are overloaded with long-term work at the

expense of physical health. In exchange for work, learning performance, some young and promising high tube, white-collar workers and employees have sub-health, physical and mental exhaustion, fatigue syndrome and cervical vertigo.

2. Materials and Methods

2.1. Multi-Sensory Interaction

Interactions with products inherently facilitate a multisensory experience with a certain quality. [5] Psychology refers to the information pathway that people receive and respond to as a “*modality*”. Human accept information through “*sensory modality*” and output information via “*effect modality*”. The effect modality here is equivalent to the action modality. The sensory modality mainly has visual, auditory, tactile, force, kinesthetic, olfactory, and taste sensations. The effect channels mainly include hands, feet, head and body, language (sound), eyes, expressions, etc. Multi-sensory interactions combine multiple sensory modality and effect modality.[4]

"In fact, the best interface should be a lot of different and coexisting communication channels... a communication channel may be able to make up for the lack of information transmitted by other channels." [5] The communication channels correspond to people's variety of senses. When people hear a voice, they go to see it habitually. When they see beautiful flowers, they will want to go down to smell the fragrance of the body. Smell the smell of fragrant flower will naturally think that this flower is beautiful.

People's various senses are connected, so in ancient China there would be poets who used poetry to use "synaesthesia". A single sensory input is not in line with human cognitive habits. In human daily life, multiple sensory and behavioral channels are interdependent and synergistic, and the combination of multiple senses is a natural and efficient way of interaction.

2.2. Experience-Driven Design

Designers can enrich user experiences by purposefully involving negative emotions in user-product interaction. It aims to create rich experiences rather than pleasure, playfulness or positive appeal, and opposite in its consideration of emotions because it conceives negative emotions at the basis of these rich product experience [6] . With the multi-sensory interaction, both negative and positive emotions can be generated.

2.2. Research on Office Workers Health Issues

After a questionnaire on the research on health conditions of office workers, 60 questionnaires were distributed and 60 valid questionnaires were issued. The summary is shown in Figure 1.

According to Figure 1, In terms of age, 75% is at the age of 20-35. In this age group, the results of the questionnaire indicate that most of the consecutive sitting time is more than four hours, and most people have different degrees of shoulder problems. At the same time, most people have different methods of relieving pain, such as massage, acupuncture, equipment, etc., but because they are passive to relieve the discomfort of the body after the pain is generated, the impact is immense. The survey results show that many questionnaire participants do not have time to exercise on account of overworking. Finally, the majority of the user community prefers to use more gentle products in the office.

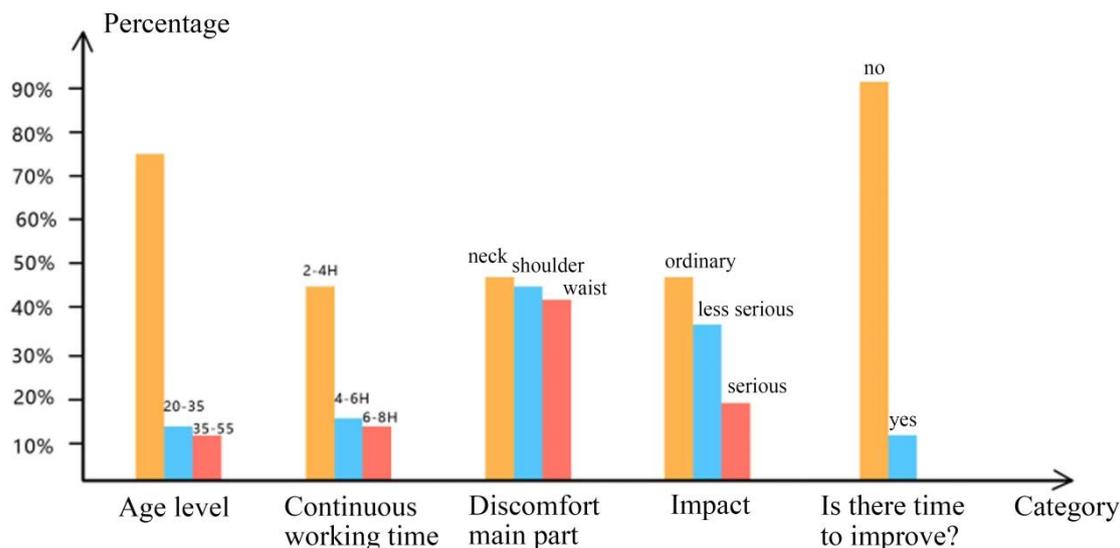


Figure 1. Health conditions of office worker.

For this research, the user group is office workers between the ages of 20-35, which have higher acceptance of new things. The product should have a default scientific reminder of time and by means of both positive and negative emotions generated through the process of user-product interaction. It can solve the problem of sedentary users, thus fundamentally alleviate various discomforts as well as prevent various diseases caused by sedentary.

2.3. Interactive Information System Architecture

This study is intended to solve the sedentary problem with a pillow system. The system is divided into two parts: the physical pillow and the computer-side interactive experience. The physical pillow includes a buckle and an elastic band, a Bluetooth module, a vibration module, and an infrared sensor module. The design of the buckle and the elastic band allows the user to move the pillow to a comfortable position according to the situation, and the infrared sensor module detects when the user sits down. The information is transmitted to the computer through the Bluetooth module and the timing is started. After the computer reaches the set time, the computer communicates with the physical pillow through Bluetooth and alerts the user through the vibration of the vibration module. Furthermore, the pillow system will generate unpleasant sound to embarrass users with the condition that the users don't get up on time. The computer reminds the user through dynamic visual image and sound.

3. Results and Discussion

3.1. Computer-side Interactive Experience Design

When the human is sitting on the seat, the internal thermal infrared device of the product senses the proximity of the human body, as well as automatically opens the Bluetooth sensor module inside the product, then connects with the Bluetooth of the computer, and displays the animation along with connected sound effect (HI). Figure 2 shows.

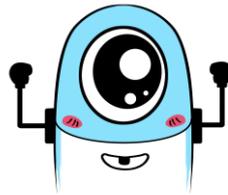


Figure 2. Dynamic picture of greeting after confirming connection.

When the computer client senses that the user has been working in the office chair for a certain period of time, (the default time of the system is one hour, the user can adjust the reminding time by himself), and a random reminder animation appears in the lower right corner of the computer. Figure 3, Figure 4, Figure 5 show:

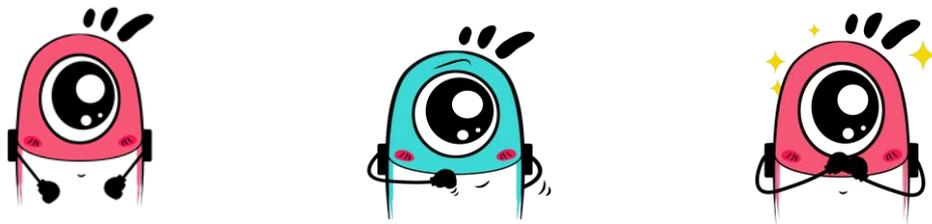


Figure 3. From left to right, there are dynamic pictures with sound effects wow, um, wow respectively.



Figure 4. From left to right, there are dynamic pictures with sound effects groan, flame noise, and snoring respectively.



Figure 5. From left to right, there are dynamic pictures with sound effects fart, firecrackers, and screams respectively.

When the user receives the reminder and he can choose to leave the seat or continue working, it is then divided into the following two ways of interaction.

- a. The user gets up, the product senses that the user gets up, turns off the Bluetooth of the internal device of the product, the computer Bluetooth connection is disconnected, the PC stops running, and the data is retained.
- b. The user doesn't get up and continue to work. After a period of time, the product senses that the human body has not left the seat. The Bluetooth is always connected and reminded again within a certain period of time until the user leaves the seat to relax.

3.2. Explosion Map and Usage Scenario

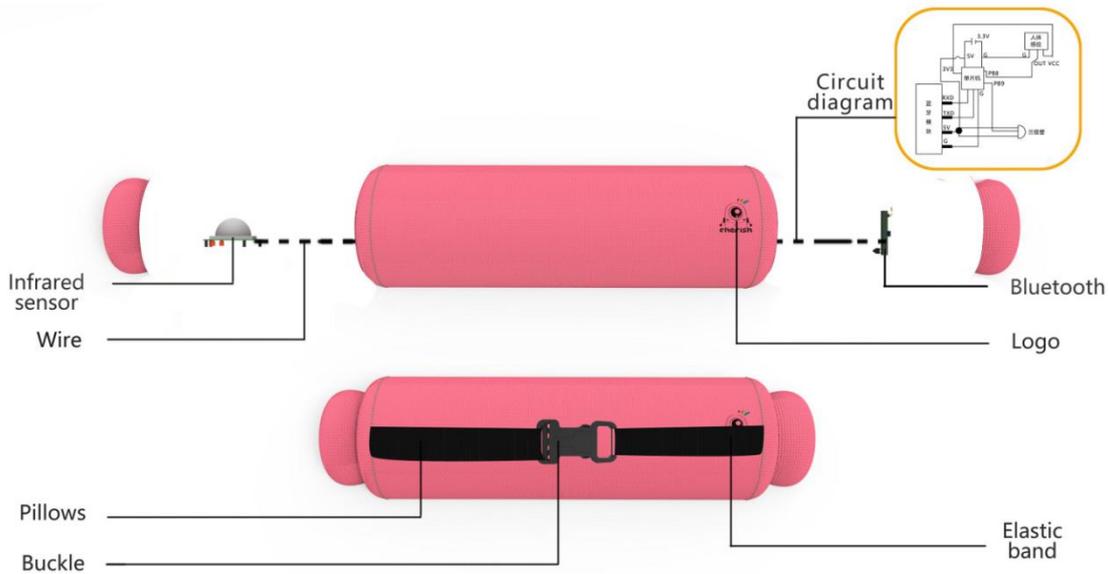


Figure 6. Explosion map.

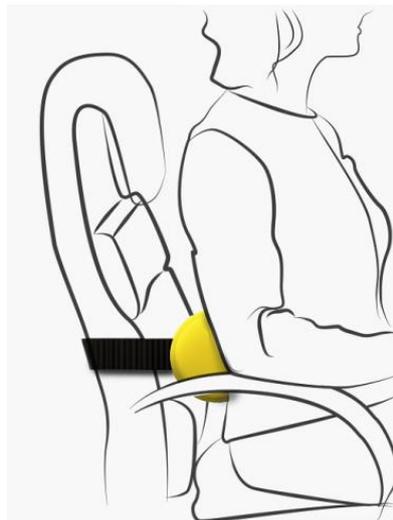


Figure 7. Usage scenario.

3.3. Discussion

The difference in the way of interaction is the main difference between the existing pillows on the market and the pillows of the subject. Products can evoke a wide range of emotions, both negative and positive. [6]

The existing pillows on the market are relatively simple in interaction. The multi-sensory interactive pillow of this subject combines a variety of sensory modalities and effect modality in an interactive manner. The sensory modalities include tactile, visual, and auditory, and the effect modalities include the head and the body. The combination of multiple senses makes the interaction process more natural and efficient. There are heat sensing devices, Bluetooth devices and vibration modules inside the product. When the user sits in the office chair for more than a certain period of time, the pillow itself will warn the user by means of vibration, and the computer will make use of the sound and visual interaction to remind the user to get up to activate their body, helping users to fundamentally relieve physical discomfort and prevent various diseases caused by sedentary. If the user does not get up, the computer will emit various sound effects such as groan, snoring, fart, firecrackers, screams, causing the user to have awkward and uneasy psychological reactions to prompt the user to get up. Compared to existing products on the market, the way of interaction is more vivid and natural, and the experience brought to users is even more different. Figure 8 shows.

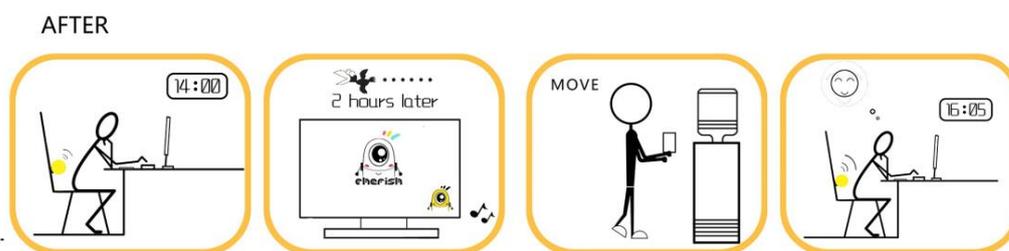


Figure 8. The scenario when user uses the product.

4. Conclusions

This topic combines the theory of multi-sensory interaction to propose a natural interactive pillow solution for the health problems of the current office family. The interaction process between human and product combines multiple sensory modalities and effect modalities making the interaction process more natural and efficient, and effectively improves the sedentary problem of the office crowd.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Acknowledgments

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