Suggestions for the Design of Home Parent-child Interactive Fitness Products based on Internet of Things (IoT) Technology

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Abstract. With the rapid development of Internet of Things (IoT) technology, a lot of fitness equipment has been intelligentized. The article will analyze the existing home fitness products and their related technologies and functions from the perspective of "Internet of Things", taking parent-child interaction as the entry point of the design research. Through the research of school-age children and their parents, we summarize the current situation and needs of this user group for home parent-child interactive fitness products, as well as give the design positioning for the shortcomings of the existing products. Finally, it proposes the development direction of the future design of home parent-child interactive fitness products under the Internet of Things (IoT) technology, and puts forward the corresponding suggestions for the subsequent design of home parent-child interactive fitness products, which lays the foundation for the future design.

Keywords: Internet of Things, Parent-child Interaction, Home Fitness Products

1 Introduction

Nowadays, the Internet of Things (IoT), as an emerging industry, has led to the innovative development of various industries and brought great convenience to people's lives. With the advancement of science and technology, people's material standard has also been rising, and the pace of work, study and life has been accelerating, more and more people are paying more attention to health issues. And along with the call of the national national fitness program and the change of the national fertility policy, people's fitness awareness is increasing, and the number of people who pay attention to family fitness and parent-child fitness is also increasing [1]. The accelerated pace of life has resulted in less time for parents and children to spend together, and parents are often too busy with their work to recognize the importance of parent-child interaction for children's development. According to the Chinese children's age division standard, school-age children are the age when the school education mechanism works, as the future of the motherland, is in the important stage of physical and mental development, effective interaction between parents and children is conducive to the healthy growth of children [2]. Home fitness products as people at work, study leisure time of a kind of exercise, relaxation and decompression, but also

can not be subject to the weather, the environment and other factors, is gradually by the public favorite.

As a result, this paper will take home fitness products as a carrier, from the perspective of parent-child interaction, design and analyze the home parent-child interactive fitness products under the Internet of Things (IoT) technology, so as to put forward the design direction of the future development of this industry, and put forward the corresponding suggestions, laying the foundation for the subsequent design implementation.

2 The State of Fitness Products with IoT Technology

The Internet of Things (IoT), as the name suggests, is the exchange of information by connecting all objects to the Internet through information sensing devices. That is, things are linked to each other in order to achieve intelligent identification and management. And with the Internet of Things technology continues to follow, as well as people's demand for a healthy life, the intelligentization of fitness equipment towards inevitable. Currently, combining fitness equipment with the development and design of Internet of Things (IoT) technology, IoT fitness products have emerged in the fitness industry. Existing fitness products make full use of digital communication technology, automatic sensing technology, human-computer interaction technology and intelligent processing data technology under the Internet of Things , which provides more new ideas for the development of fitness product design [3].

Existing Internet of Things fitness products, the biggest advantage is its organic integration of fitness users and fitness products and services, to a great extent, to improve the user experience, so that more users experience a different fitness service resources. For example, the rise of wearable fitness products that utilize artificial intelligence technology to design sports watches that monitor data. Exercise not only realizes health tracking, but also provides reasonable and correct fitness action guidance based on your heart rate blood oxygen and fitness goals, which greatly improves the user's fitness experience to achieve the best fitness results. In addition, the current popularity of immersive virtual reality (VR) technology, that is, the ability to wear a smart device to remotely monitor different sports channel projects, so that the virtual present simulation of on-site sports, not only to provide users with an immersive fan experience, but also to achieve the effect of exercise.

But in fact, in the current information diversity, the fitness products, in addition to improve people's sense of user experience, it is also subconsciously changing people's consumption of fitness products. Experience consumption and cultural consumption are gradually becoming the focus of users' pursuit.

3 Current status of home parent-child interactive fitness product design

3.1 Analysis of Non-smart Home Parent-child Interactive Fitness Product Design

Before the popularization of IoT technology, most families use non-smart parent-child interactive fitness products. In this regard, select several representative products, and

investigate and integrate their characteristics and defects for comparative analysis. As shown in Table 1.

Table 1. Non-smart Home Parent-child Interactive Fitness Product Research

Name of Product	Table Tennis	Interaction Springboard	Home Indoor Bars	Boxing Training Targets
Features	Easy operation, ensorimotor training	Aerobic exercise, balanced rhythmic training	Stretching the spine, helping to grow	Strength training, reaction speed training
Drawbacks	Single mode of interaction, lack of fitness effect	Less interactive	Fixed indoors, prone to wall damage	Indoor noise
Comparative Analysis	Although there are various types, they are all relatively single-function and not very interactive. The scenes are homogenized, which tends to be boring and uninteresting, and most of them also hardly provide some fitness effect.			

3.2 Analysis of Smart Home Parent-child Interactive Fitness Product Design

With the rapid development of the Internet of Things technology, the current market existing intelligent home parent-child interactive fitness products, basically solved the original non-intelligent products with a single function, so that the product function is more diversified, so that the interactivity is strengthened and more interesting. As shown in Table 2.

Table 2. Smart Home Parent-child Interactive Fitness Product Research

Name of Product	Smart Rope Skipping Machine	Camera Wireless Dance Carpet	Smart Fitness Mirror
Features	Multiplayer interaction, bluetooth for music, large display counting	Human-machine interaction, easy operation, variety of scene patterns	Somatotopical interaction, take up less space, variety of scene patterns

Functionalit ies	SiIntelligent counting, remote control, adjust the speed of rope skipping	Real-time transmission of footage, capture the movement of people, track motion status	AI recognition, real-time feedback, somatosensory control, scenario-based teaching

Based on the research and analysis of the above products, it can be found that the intelligent home parent-child interactive fitness products under the Internet of Things technology, in essence, is a fitness equipment as a carrier that can be connected to the network. Thus, its carrier can directly exchange information and communicate with people, realize the intelligent identification of fitness movement, make fitness data more intuitively embodied, exercise scenes more situational, and the interaction is more interesting [4]. The whole process realizes the functions of acquiring, transmitting, processing and applying information under the Internet of Things technology.

4 User Research and Analysis

4.1 Purpose and Significance of the Research

This research was targeted at school-age children aged 6 to 10 years old and their parent users. Because children in this age group do not have heavy learning tasks, they have some free time to interact with their parents. And in terms of the way they interact with their parents, they have more ways of interacting than preschoolers and are less likely to be limited by their physical mobility, making the study of parent-child interactive fitness products more meaningful. The purpose of this research is to summarize the shortcomings of the current existing products through an in-depth exploration of intelligent home parent-child interactive fitness products under the Internet of Things (IoT) technology, and by combining the current situation and needs of users.

Based on the National Physical Fitness Standards for Students, at present, school-age children are not only assessed on the basis of their physical form, physical function and physical fitness in a comprehensive manner [5]. It is also tested through sports programs and the results are included in the assessment for promotion to higher education, so practically speaking, this is enough to draw parents' attention to their children's physical activity [6]. As students are restricted by the cultural curriculum in school, the time for physical exercise is not sufficient, so the exploration of home fitness products is of great significance. And the close interaction between parents and children can more effectively promote the development of students' physical fitness and physical and mental health, and also ensure the development of school physical education.

4.2 Analysis of User Status and Requirements

The research location mainly focuses on elementary school campus entrance, playground and park and other exercise places. The analysis of the current situation and needs of parent users was the main focus, supplemented by school-age children. Through questionnaires to parent-users and in-depth interviews with parents and

school-age children, we summarize the current status of user demand for home-based parent-child interactive fitness products:

- Outdoor exercise generally need to consider the weather, temperature, time, location and other factors, so home parent-child interactive fitness products have a great market prospect.

- The current situation of physical and mental health of school-age children is grim, and there is an urgent need to improve physical and mental health by strengthening physical activity [7]. The current sports programs on each campus include: mandatory long-distance running, optional ball sports, and optional physical fitness. The target users want the product's exercise form to start from the above activity methods.

- School-age children and their parent users are under pressure from school and work, so they tend to neglect fitness and find it hard to stick to it. The target users hope that the product can mobilize the motivation to exercise.

In response to the above summary, the details of the data analysis of the current status and needs of the target users were compiled. As shown in Figure 1, Figure 2, and Table 3.
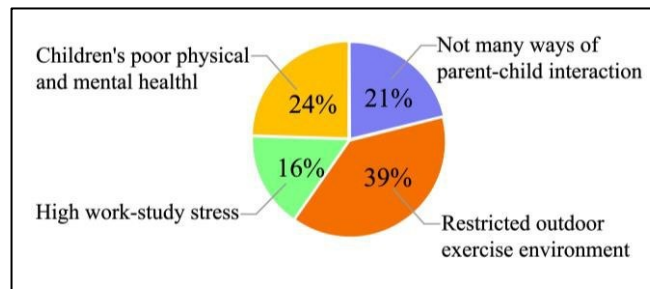

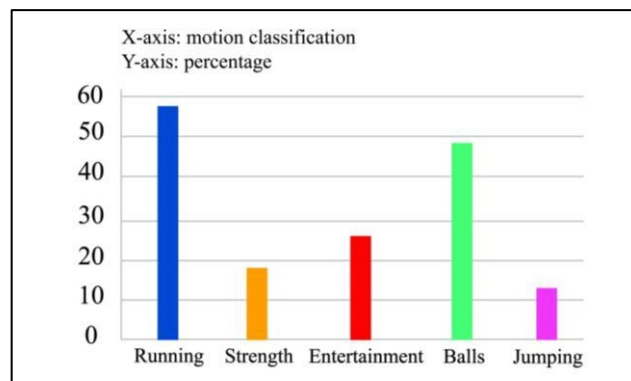**Fig 1.** Distribution of current problems of target users

Fig 2. Map of product types expected by target users

Table 3. Degree of demand for product attributes by target users

Options	Percentage (100%)

Value for Money	36
Practicality	91
Fun	80
Safety	85
Environmentally friendly	47

4.3 Product Design Positioning

According to the user status and demand analysis described above, it can be found that there are still many shortcomings in the design of intelligent home parent-child interactive fitness products at this stage, and the following will be proposed to address the problematic points of product design positioning:

- The research found that users in outdoor sports, in addition to consider the environmental factors, but also pay special attention to outdoor safety. However, although home fitness products can avoid the dangers caused by the complex structure of outdoor personnel, but the safety of the process of use cannot be guaranteed. It is necessary to further improve the quality and quality of the products from the perspective of child users when designing, so as to ensure their safety.

- According to the national physical fitness assessment standards for students, as well as the requirements of the physical exercise courses offered by the school, the current home parent-child interactive fitness products about running, ball and other local strength activities are rare. There are certain limitations in the product design and positioning, and the above expressions can be used to expand the way of exercise in the design.

- Users are often affected by the lack of professional guidance in the use of smart products, boring home fitness environment, poor indoor air quality and other factors, which leads to a lack of motivation to exercise, not enough fun to adhere to, and poor indoor exercise experience. Therefore, if you want to improve the exercise motivation to solve the above problems, the product design needs to maintain a certain degree of fun guiding significance, so that parent-child interaction exercise can achieve the desired effect.

5 The future of Product Design

Based on the problem points summarized in the above user research, a design orientation is proposed for the shortcomings of existing products. In the following, the design development direction of future intelligent home parent-child interactive fitness products will be specifically proposed.

5.1. Safety

Products related to children are inevitably designed with safety in mind. Children are generally lively and active by nature, both psychological and physiological development is mature, and the lack of life experience leads to a relatively weak sense of safety and self-protection. Therefore, when using the product, the slightest carelessness may cause serious consequences [8]. And parent-child interactive products emphasize the principle of interactivity. Therefore, in the design, not only need to consider the limitations of children's activities, but also to ensure the safety of

the interaction between parents and children, so that parents can control the degree of interaction within their ability to maximize the effect of exercise. In addition, both in the choice of materials and appearance, need to give users enough security [9]. For example, choosing environmentally friendly and moderately hard materials, avoiding sharp edges and small parts, the appearance and internal structure should be solid and so on.

5.2. Diversification of Sports Forms

Currently on the market existing intelligent home parent-child interactive fitness products, although a wide variety of functions, but most of the functionality of the product is more biased towards the parent user. There is no reasonable use of children's users targeted, resulting in parent-child interactive fitness products in a very single form of sports performance.In this article, for the school-age children group, the school carries out the long-distance running compulsory examination program, ball optional examination program, physical fitness optional examination program of physical exercise teaching policy. In order to meet the physical fitness standards required by the state, campuses have included sports scores in their assessment for higher education, which is exactly where they should be targeting when using the product. Therefore, the product can be designed to incorporate the physical education programs offered on campus to diversify the forms of exercise. For example, the rational use of running, ball games and other forms of sports in product design is not only relevant for children, but also for their academic and physical and mental health development. In addition, if the form of exercise is related to the school curriculum, to a certain extent, it will not make children feel alienated during the exercise, and they can interact with their parents in a more harmonious and comfortable way.

5.3. Interesting Interaction

Parent-child interactive fitness products, although different from the toy products for children's games only, but in the design of its interactive fun or essential. Because the interesting design of the product can not only attract the user's attention and improve the user's motivation to use, but also reduce the user's fatigue in the process of exercise. Especially children have the nature of new and old [10]. If the cycle is always a single fitness method, the whole fitness process will often seem very boring and difficult to adhere to, resulting in poor exercise results. Then parent-child interaction is not very meaningful. And based on the above user research results, we can find that in order to enhance the user's motivation to exercise and mobilize the enthusiasm for exercise, interesting interactive fitness methods are necessary. Therefore, we can use IoT technology to gamify the design of fitness products to attract the interest of users in terms of gameplay and make them willing to explore other ways of using the products [11]. We can also design novel and lovely appearance shape, eye-catching colorful, from the visual increase in children's interest, according to the psychological cognitive and behavioral characteristics of school-age children users [12].

6 Summarize

Currently, the wide application of IoT technology promotes the upgrading of product design concepts. People's demand for a healthy life and fitness experience is increasing, and the attention paid to home fitness equipment is also greatly increased. Therefore, the safety performance of its products, intelligent features and good interactive form is also more and more concerned. In this context, this paper takes parent-child interaction as the entry point of design research, and analyzes the current status of the design of intelligent indoor parent-child interactive fitness products under the Internet of Things (IoT) technology. And through the research of school-age children and their parents users, summarized the current situation and needs of this user group. Then the design orientation is proposed for the problem points existing in the existing products. Finally, the design development direction of future intelligent parent-child interactive fitness products is concluded, laying the foundation for the subsequent design implementation. In summary, in today's networking of households, and under the craze of national fitness, the application of intelligent household parent-child interactive fitness products under the Internet of Things technology has certain research value and market prospects, and its development potential should not be underestimated.

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