

Research on the Application of Wearable Devices for Aging in the Context of Intelligent Governance

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Abstract— With the booming development of mobile information technology such as data interaction and Internet of Things, the fields involved in wearable devices are also constantly expanding. In the process of iteration, the product is constantly integrated with new technology, and has played an excellent performance in real-time monitoring, remote monitoring and other aspects. However, the health risks of the elderly in their daily life are mainly due to the difficulty of round-the-clock care. The emergence of wearable devices fills this gap and provides a guarantee for the intelligent management of the aging population. Based on the actual needs of pension services under the background of intelligent governance, this paper analyzes the practical application and reflection of existing wearable devices on aging management.

Keywords— Wearable devices; Aging management; Digital feedback; Ethical risk.

I. INTRODUCTION

With the rapid increase of the number of elderly people, China is gradually stepping into an aging society, and the situation of empty-nest families is becoming increasingly severe, and the pressure on the society to provide for the elderly is becoming more and more heavy. Although the children of the elderly can provide certain material security for the elderly, the quality of life of the elderly who are not with the elderly for a long time without supervision are seriously reduced. The popularity of wearable devices has injected new vitality into the management of the aging society, and with the continuous improvement of its intelligence level, it has promoted the intelligent management process of the aging society.

II. APPLICATION OF WEARABLE DEVICES IN THE CONTEXT OF THE INTELLIGENT COMMUNICATION

1. Intelligent watches

Intelligent watches are the mainstream products of wearable devices. With strong functionality, wide use and small size, they are easy to carry. Therefore, many brands are competing for research and development, showing outstanding performance in visualization, interactive and health monitoring.

In June 2013, GENK Electronics Co released GEAK Watch, a dual-system compatible intelligent watch. With the support of WIFI, Bluetooth and other technologies, this watch can still connect to the network without a mobile phone terminal, and check real-time SMS, incoming calls and emails. In autumn 2020, apple launched an updated version of the smart watches, it through the innovation of sensor and the App again, the measurement of blood oxygen level, real-time monitoring

of the user's heart rate, in the event of abnormal heart rate and will be triggered warnings that to the customer, so that the wearer to take measures in a timely manner, provide safeguard for health.

2. Intelligent bracelet

Intelligent wristband is a derivative of watch. It mainly shows the amount of exercise, heart rate and sleep in the daily life of the user directly on the electronic device in a quantitative way, so that the wearer can clearly understand their physiological data, so as to scientifically adjust and improve their living habits.

With the development and progress of science and technology, China has been in the forefront of the smart bracelet in the world. In 2014, XIAOMI wristband launched the product form from no screen to screen, large screen to small screen. With the continuous iteration and upgrading of the product technology, in addition to the conventional exercise status, sleep monitoring, intelligent silent wake up, XIAOMI wristband also added functions such as blood sample detection to carry out more comprehensive monitoring of the body. In addition, the Mi band also supports IP67 waterproof, which meets the needs of users for underwater sports. At that time, smart wristbands still had a certain degree of social value. People uploaded their exercise data to the moments of friends to share and supervise each other. XIAOMI wristbands were also popular quickly due to its advantages of high cost performance and complete functions. A good lifestyle is the primary standard to maintain health. The smart bracelet provides users with specific fitness life guidance by monitoring and analyzing behaviors that are difficult to quantify in life.

3. Clothing for intelligent monitoring

This kind of clothing can monitor the wearer's health through the implantation of partition technology and sensors. For example, the smart shorts launched by LUMO in California, the United States, can track hip and pelvic movements through the configuration of tiny sensors, and then transmit the corresponding data to the corresponding APP of smart phones. LUMO Run smart shorts can track the wearer's movement throughout the whole process, such as running route, number of steps, jump height, etc. By collecting and deducing the data, the injury probability of the wearer can be calculated and suggestions can be put forward in real time through earphones, so that the wearer can adjust sports behavior in time to prevent injury.

4. Intelligent antibacterial clothing

Antibacterial clothing mainly focuses on the development of biological antibacterial materials and has made beneficial exploration in the research and development of new materials. For example, the chitosan antibacterial material studied by Wang Sifan's team has the advantages of biodegradability and good biocompatibility, as well as skin-friendly, anti-inflammatory, analgesic and wound healing effects, and has achieved good results in bacteriological deodorization, prevention of bacterial breeding and skin disease infection.[1] JUST5 Associates has developed a versatile smart fashion coat that uses Hei Q Viroblock antibacterial fabric technology to eliminate 99.9% of bacterial viruses from the coat surface in 5 minutes; Diesel, an Italian brand, has introduced an innovative denim fabric treatment technology that uses sensing technology to rapidly reduce viral activity by over 99.0% within 2.0 hours of pathogen contact with the fabric, achieving intelligent antibacterial effect.[2]

III. THE PAIN POINT OF AGING SOCIETY GOVERNANCE

Along with the arrival of an aging population, the social governance of our country is faced with a series of new challenges, particularly in the aging treatment, and brought new tasks for the family, in which the first is the problem of elderly care, family endowment function is not perfect, community endowment service quality is uneven, pension institutions is not attractive and pension security existence hidden danger that occupy the home, These problems make aging governance into a dilemma.

1. The old-age dependency ratio is on the high side, and the old-age support function of families is increasingly weakened

The primary manifestation of aging society is the imbalance of population structure and the increase of old-age support ratio, which leads to the shortage of effective labor force and makes the traditional family pension increasingly powerless. In recent years, according to the data of the National Bureau of Statistics, China's aging trend is increasingly obvious. China's population structure and dependency ratio increased year by year from 2011 to the end of 2020. The total dependency ratio increased from 34.4 percent to 45.9 percent, and the child dependency ratio increased from 22.1 percent to 26.2 percent, fluctuating in waves. The elderly dependency ratio increased from 12.3 percent to 19.7 percent. The higher the dependency ratio, the heavier the dependency pressure on young people. According to China's dependency ratio, the elderly dependency ratio is rising faster than the child dependency ratio year by year, so the number of elderly people who need to be cared for is increasing year by year, and the demand for nursing labor force is also expanding. Nowadays, due to many reasons such as economic, migrant workers, mostly young children in the home and family to reduce the economic burden, time and energy taking care of old people will naturally reduce greatly, so the questions about nursing the elderly has become the most family development reality, and will this dilemma with the acceleration of aging will be growing.

2. The quality of social pension services is low, and pension institutions are not attractive

The weakening of family pension function makes the society have to bear part of the pension pressure. However, due to the widespread problems of poor management and poor service quality in China's pension institutions, negative news about pension institutions often appears on the Internet. Under normal circumstances, if it is not the force majeure factors of the family, the elderly are not willing to go to the pension institution to live. At the end of 2020, China had a total of 329,000 nursing homes and facilities, but their actual occupancy rate is not ideal. According to a survey conducted by Qiao Xiaochun, a professor at the Population Institute of Peking University, only 13 percent of the registered elderly over the age of 60 in Beijing choose pension institutions, resulting in a large number of empty beds in these institutions.[3] The low occupancy rate is closely related to its operation and profit model. Pension institutions are low-profit enterprises. In order to pursue profits and sustainable development of institutions, they will try their best to keep costs at the lowest level. This means that the quality of catering, living and service will be compressed to a certain extent, leading to the elderly cannot get more comfortable living experience than at home. In addition, compared with the family pension group, the elderly who choose to live in institutions will hope to get more advanced pension services. However, in fact, their real feelings about living in institutions often have a huge contrast with their expectations, which ultimately affects the occupancy rate of social pension service institutions.[4] In addition, the low occupancy rate is also related to personal, family and social and economic factors, which determine the preference and choice of the elderly for different ways of supporting the elderly. However, relevant studies show that in any case, the elderly do not have a strong will for institutional pension.[5]

3. Lack of technology and facilities related to home care, high health and safety risks for the elderly

With the continuous improvement of China's industrial civilization, the decentralized family pension mode based on agricultural civilization is facing transformation, and is gradually replaced by the centralized community pension mode or socialized pension mode. However, due to the old people's traditional ideas, the operation of pension institutions and practical reasons, there is a certain difficulty in the promotion of the form of social pension. Therefore, the relevant departments based on the respective advantages and disadvantages of family pension and social institution pension, through analysis and comparison, foster strengths and circumvent weaknesses, promote a new way of pension-home pension. Home care refers to a service form that takes family as the place for the aged, relies on community service network, takes door-to-door service and community day care as the main form, the government, society, family and individual share the source of funds, and actively mobilizes social forces to participate in the service. At present, home-based care is popular among the elderly, who can enjoy more considerate, professional and perfect care services in a familiar family environment. It combines the dual advantages of traditional

family care and social institution care. At the same time of solving the problems of living, but also to protect the physical and mental health of the elderly.

However, compared with nursing in social institutions, home-based care belongs to the semi-self-service mode, and nursing staff cannot accompany them all the time. If their children go out for work, the elderly will often be left alone, with many inconvenience in life and great health and safety risks. At present, community home care facilities cannot fully and effectively cover and meet the needs of the elderly, and there are many problems in health testing management, daily life services, spiritual entertainment services and other aspects, especially for the disabled and semi-disabled elderly, who need more refined nursing and professional medical rehabilitation services. At the same time, the elderly lack of family companionship, will have a strong sense of loneliness and spiritual vacancy, in the material security at the same time, they are more eager to get spiritual and cultural satisfaction. The limitation of the scope of activities also leads to the blank of their interpersonal communication, resulting in serious psychological problems over time.

IV. WEARABLE DEVICES CAN BE APPLIED IN AGING MANAGEMENT

Nowadays, wearable devices have been available in a variety of product forms in the market, such as smart wristbands, smart watches, smart glasses, smart clothes and various smart accessories. The functions of these wearable devices have been gradually improved through continuous feedback from users during use. With the development of Internet of Things technology and the optimization of product functions, wearable devices have a good prospect in the application of monitoring function for the elderly.

1. Real-time monitoring response

Cardiovascular diseases and other diseases with high hazards and high risks that the elderly are prone to have a certain incubation period and sudden onset, which are difficult to be detected through short-term monitoring, threatening the life safety of the elderly at all times. In addition, the elderly seldom carry out all-round physical examination regularly, and cannot detect and predict diseases in time. Wearable equipment real-time monitoring function to the old man's physical condition can be long-term and uninterrupted inspection, records, and then the data uploaded to the intelligent terminal, and compares the system of medical professional data, analysis, screening, if appear abnormal data circumstance, can in time send warning information to the guardian's mobile phone, timely rescue work. The real-time monitoring, analysis and warning functions of wearable devices can greatly reduce the risk of treatment and rescue for the elderly, and avoid accidents caused by the elderly not receiving timely treatment. The real-time monitoring response of wearable devices will also greatly promote the improvement of the quality of elderly care services.

2. Real-time collection and tracking analysis of physiological data

With the development of science and technology, sensor technology is also in progress greatly, electrocardiogram, electroencephalogram, blood pressure, blood oxygen saturation and heart sounds, and many other sensors are continuously research and development and application, and the sensor has the characteristics of small, lightweight and save electricity, can with wearable devices effectively, is advantageous for the equipment acquisition of various physiological data, Meanwhile, with the rapid development and application of mobile Internet platform and cloud big data resources, relevant data can be processed and analyzed in a timely manner, and then the analysis results can be compared with the health data of the human body, providing a more scientific plan for body regulation and reducing the probability of sudden illness for the elderly. At present, with the continuous improvement of China's scientific medical system, the accuracy of medical data analysis ability of wearable devices is also improving, and its credibility is getting higher and higher. At the same time, wearable devices must have stable collection ability in different scenarios to ensure real-time and accurate collection of physiological data. Based on the wearer's own physical condition or daily living habits, wearable in different scenarios can be customized and equipped with corresponding data collection equipment to achieve the accuracy and continuity of long-term data collection and analysis.[6]

3. Improving the effectiveness of emergency response and assistance

The wearable device's real-time physiological data monitoring, GPS positioning and motion analysis capture technology enables the physical condition, activity track and movement behavior of the elderly to be recorded in time, which greatly reduces the chance of the elderly getting lost and can be treated in time when the acute symptoms of the elderly occur. Abnormal heart rate and respiration are most common in the elderly in daily life and sleep at night. If it is not found and treated in time, it is likely to lead to accidents, especially for the elderly who live alone. And wearable devices of physiological data monitoring can be found in a timely manner, abnormal data real-time motion capture technology is also recorded the irregular movement, again through the data real-time transmission, provides the concrete position of the old man injured and health warning to their guardians, the health care system will be improved when will these data synchronization provided to nearby medical institutions, Greatly shorten the rescue time, increase the success rate of treatment.

4. Replace labor and save social costs

In the traditional pension industry, although the amount of labor input is large, the supply is still short of supply. The introduction of wearable devices relieves the pressure of manual demands. In the traditional pension model, the elderly cannot get 24-hour care, and is greatly affected by human factors, the service quality of pension care is uneven. Portability of wearable devices can provide round-the-clock care for the old man, no continuous real-time record various physiological data, through the technology and intelligent terminal connections, the guardian can view the data anytime and anywhere, not only save the guardians of energy input, at the

same time also can save the endowment of human care payments. With the deepening of China's aging population, the problem of insufficient labor force has gradually emerged. The emergence of wearable devices has reduced the labor input of pension services, saved social labor, and alleviated the pressure of social development to a certain extent. The popularity of wearable devices can also save medical resources and relieve the pressure of medical services. The elderly do not need to go to the hospital frequently for daily physical examination, but can monitor various physiological data at home, which also provides a guarantee for the healthy life mentality of the elderly.

V. REASONS AND CURRENT SITUATION OF "DIGITAL FEEDBACK " AND ASSISTANCE OF WEARABLE DEVICES

The elderly have certain psychological barriers to the acceptance of emerging technology products, and they usually think that their life does not need the assistance of technology. With aging, the physical efficiency of the elderly also decreases, and their cognitive and learning abilities of new things become worse and worse. It is difficult to master the usage of wearable devices in a short time, and it is also difficult to easily understand the data feedback from devices, which makes wearable devices fail to give full play to their value.

1. The decline of "fluid intelligence" in the elderly

Fluid intelligence is a physiology-based cognitive ability, including basic cognitive processes such as perception, memory, computing speed and reasoning ability. Fluid intelligence is the ability that a person is born with to carry out intellectual activities, which is more dependent on innate endowment. The development of fluid intelligence is closely related to age, generally reaching its peak at the age of 20, and then declining with the increase of age. As a result, fluid intelligence is relatively low in old age. At the same time, the physiological function of the elderly is seriously degraded with age, and they no longer have a high speed of perception of things, resulting in a great impact on the memory speed of the elderly. In terms of memory, the elderly have better long-term memory, but their short-term memory ability gradually declines, and their ability to convert short-term memory into long-term memory is also very weak. Even if the operation of wearable device belongs to mechanical memory, it is very difficult for the elderly to master its operation. Old people are also prone to stereotypical thinking. Their weakened creativity and learning ability make them unable to accept and master new things as quickly as young people.

2. The elderly have a low sense of self-efficacy

Self-efficacy is an important concept of Bandura's social cognition theory, which refers to people's prediction and judgment on their ability to complete a certain behavior, that is, whether they can use their own skills to achieve the goal of confidence. People with high self-efficacy were more likely to choose tasks that were more challenging for them, and they were more likely to put in more effort to get something done than people with low self-efficacy. For people with low self-efficacy, external events tend to make them feel more pressure, and they also adopt a negative attitude towards accepting and

learning new things. Two scholars. With the passing of time, the life cycle of propulsion, the body function of the elderly is also gradually aging, many former easily done now unable to independently, many old people feel ability not equal to one's ambition of life gradually, low self-efficacy has been gradually, no longer willing to ask for them to learn new skills, loss of motivation and willingness to explore life. Even many elderly people do not know how to use many new intelligent functions on the TV remote control, let alone the use of wearable devices. Even if they try sometimes, they often give up because of obstacles. As time goes by, the confidence of the elderly is frustrated. At the same time, they are usually unwilling to communicate with their families when they encounter these problems, and eventually their sense of self-efficacy continues to decline.

3. Old people's fear of technology

Technophobia is a derivative problem brought by the continuous development of modern science and technology. The essence of this phenomenon is a negative relationship between man and technology. It is mainly manifested in people's inadaptability to the emergence of new technology and negative attitude or resistance to accept technology. The main reasons for the emergence of technophobia are the imperfection of technology, the fear of difficulties in psychological aspects and the excessive exaggeration of mass communication. In an age of Internet technology so developed today, young people for the emergence of new technology are more willing to try, but the elderly due to age, lower the sensitivity of the Internet, when new technologies appear, they have no way to fully understand, cause sudden need through the wearable monitoring equipment condition, for the fear of technology degree increases. On the one hand, it is difficult for the elderly to operate fully functional wearable devices proficiently. On the other hand, due to the influence and constraint of traditional thinking concepts, the elderly have insufficient cognitive ability of information technology, and their acceptance of information technology is always in a passive state.

VI. DIGITAL FEEDBACK AND HELP OF WEARABLE DEVICES

Field, in the family between parents and children are more likely to form a typical digital act as purchasing agency with the feedback behavior, the reality is not the case, however, there is a big problem for wearable devices used in the elderly, unable to master the use of equipment independently, usually busy with work is easy to neglect the parents and children over the use of smart devices is difficult, difficult sometimes to children, However, the decline of their fluid intelligence makes them only able to learn new skills in a short period of time, but unable to convert short-term memory into long-term memory, that is, unable to master new skills, and unwilling to disturb their children, "digital feedback" is in a long-term state of absence.

At the social level, the community, the government should be lower for the elderly media literacy to popularize the elderly college course, at present most of the university of old age is just about entertainment course of vocal music, dance, little about the intelligent equipment training courses, in order to improve the elderly for learning and ability to use relevant

intelligent device, Communities should actively implement the relevant policies of the government on "active aging", try their best to solve the problem of digital divide among the elderly, and timely carry out the learning and training of smart devices for the elderly.

VII. ETHICAL RISK OF WEARABLE DEVICE APPLICATION

Technological progress is often a double-edged sword, often accompanied by a certain degree of "side effects". In today's Internet era, wearable devices present physical elements such as human physiology and psychology in a digitalized way. Meanwhile, the connection between human and objects is also fully digitalized. Wearable devices not only bring convenience to life, but also cause people's behavioral data to be recorded all the time. A transparent and monitored era seems to gradually invade people's lives, and people's data privacy is facing threats and challenges. For the elderly group, not only the right to privacy is threatened, but also the safety of the equipment is hidden. Once the data analysis deviation occurs, the consequences are irreversible, and even endanger the life safety of the elderly.

1. Privacy of wearable

The built-in sensor of the wearable device can locate the wearer's geographical location in real time and record the wearer's physiological changes, psychological fluctuations and other private information at any time. Gathering these information for analysis and correlation inference makes the connection between people, things and the Internet more closely integrated, which means that the protection of data security and personal privacy cannot be guaranteed. Dick Cheney, America's former vice-president, voluntarily blocked the wireless functions of a medical defibrillator implanted in his chest to avoid privacy risks.

The privacy issue is mainly the result of data collection and analysis of wearable devices. In addition, there is the issue of self-disclosure, which is a key cause of privacy issues in wearable: quantifying the self. People use wearable devices to record and quantify their personal data in real time, such as exercise, blood pressure, heartbeat, mood and sleep, and even capture photos, videos or recordings in daily activities with the intention of "using data to achieve a happier self". [7] Contrary to this rosy expectation, the more data is recorded, the more privacy risks people face, the greater the conflict with their own vision. The digitalization, intellectualization and visualization of physiological characteristics are the final result of quantification, which may directly lead to people's zero privacy. In short, whether it's collecting and analyzing data through sensors or quantifying the self, wearable create a privacy paradox: people value their privacy, but are desperate to give it up. [8]

2. Privacy of people who do not wear wearable devices

Wearable devices not only record the data of the wearer, but also monitor the wearer's surrounding environment, that is, the data of people around who do not wear the device. Wearable devices are highly sensitive to the environment. In order to accurately collect the wearer's information, the wearer's

surrounding environment data will be monitored and recorded in real time. At the same time, the wearable's small, portable nature makes its camera extremely hidden and unobtrusive, allowing it to capture photos and record audio or video without being noticed. Because, without the consent of the people, for people who do not wear equipment, video recording, a serious violation of their privacy, and these images, audio, video, once again after a malicious clips through illegal means a large number of transmission, would lead to not wearing the equipment, the phenomenon of the social awkwardness, reputation losses, or a direct threat to their safety.

In essence, privacy itself is control over the flow of information. The problem of privacy is the asymmetry of information possession between the two parties, that is, the inequality of information possession between the two parties. This is particularly evident in the privacy of people who do not wear wearable devices. People who wear wearable devices have more information of people who do not wear devices, or even the latter basically does not own the information of people who wear devices. Therefore, among the privacy issues related to wearable devices, the privacy of people who do not wear wearable devices is "transparent" and "naked", which can be said to be a major difficulty in the privacy protection of wearable devices. [9]

3. The safety of wearable devices

The safety of wearable devices for the elderly mainly lies in the accuracy and reliability of data, and the accuracy and stability of physiological data collected by wearable devices for the elderly, which directly affects the health and life safety of the elderly. If there is deviation in the data collected by wearable devices or data analysis results are not accurate enough and data distortion occurs, the elderly will still rely on these data to take follow-up actions most of the time, and it is highly likely to have unexpected consequences caused by misjudgment. For the elderly suffering from diseases, the monitoring data obtained by wearable devices is an important reference for relevant personnel or institutions to carry out health care and nursing for the elderly. Once the data distortion, it is likely to lead to the elderly miss the best treatment opportunity, endangering the life of the elderly.

VIII. SUMMARY

With the development of economy, people's demand for elderly care services is getting higher and higher. Wearable devices with guardianship function have great prospects in elderly care services. Wearable devices are constantly updated and iterated with the progress of science and technology, with more and more comprehensive functions. The continuous research and development of sensors and the continuous improvement of medical system enable wearable devices to provide more accurate health management for the elderly. The government should also vigorously popularize the significance of the use of wearable devices by middle-aged and elderly people and the monitoring role of wearable devices in the health management of elderly people, encourage the collection of big health data of elderly people, and facilitate the intelligent governance of China's aging society.

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