Research on the Design of Health Management System Based on Community Rehabilitation

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Abstract. Objective to explore the design path of community rehabilitation health management system which can improve the experience of community users and optimize the rationality of online health management and offline diagnosis. Using the survey method of user journey map and service blueprint, the current community rehabilitation health management system is analyzed in users' path and the pain points are extracted while the core needs are found and the functions of the needs are converted. The kano model is used to classify and identify the importance of users' original needs, sort out the structure of community rehabilitation health management system according to the priority of needs, and provide theoretical guidance for design innovation. Through the hierarchical analysis of the demand elements by kano model, five specific optimization directions of the community rehabilitation health management system, including self-inspection, diagnosis and treatment visualization, health assessment, health development prediction and health planning adjustment were obtained, and the high-fidelity interface design of the health management system app based on community rehabilitation was formed. Our re-search suggests the technical path and design principles of the community rehabilitation health management system which can provide a certain method and reference for subsequent similar research.

Keyword. Kano model, community rehabilitation, health management, service design

1 Introduction

With the rapid development of primary public health measures and medical advances in China, the target population of community-based rehabilitation has begun to expand to include people living in the community who need to receive long-term medical service support and health management, such as people with chronic diseases, the elderly and people with disabilities [1]. Because of the long-term nature of treatment for users

receiving community rehabilitation services, in order to effectively maintain the effect of rehabilitation treatment, the use of technologies of smart medical and big data to manage users' health and form an online and offline medical and health model [2], improve users' awareness of health maintenance will effectively help solve the problem of shortage and unbalanced optimization of medical resources as well as promote healthy communities construction [3].

1.1 Research and Analysis of Community Rehabilitation Health Management System

Community rehabilitation health management emphasizes individualization [4] and community participation [5] to take appropriate health management measures based on the unique health needs of individuals and their disease risk [6] and ability to cope with disease risk [7], and to develop individualized community rehabilitation health management plans to assess the various factors affecting health faced by individuals in order to intervene and improve the health status of users [8]. Wang Ying-qi explored the community rehabilitation health management model to carry out a five-level health management organization to give full play to the advantages of community hospitals in the hierarchical diagnosis and treatment of patients and provide comprehensive health management services for users [9].

Foreign community rehabilitation health management has shown a multi-modal development trend in recent years due to its early development [10]. Finland provides multi-level health management for users by combining rehabilitation treatment, media promotion and food safety. The UK pays attention to the impact of health and health knowledge dissemination on users and raises users' awareness of health management by forming community health education and support agenda organizations with general practitioners as the core. In the United States, insurance companies mainly organize health tests by physicians and provide health management services to community enrollees [11].

1.2 Implications of the kano model for guiding community-based rehabilitation health management systems

The kano model is an important model for defining the quality of a product or service in terms of the degree of satisfying user needs and was proposed by Professor Noriaki Kano at the Japan Quality Management Conference in 1982 [12]. Kano model classifies user requirement elements into five types [13] according to the difference in the type of impact of requirement elements on user satisfaction, which are A (attractive attributes), O (one-dimensional attributes), M (must-be attributes), I (indifferent attributes), R (reverse attributes) [14].

Using the kano model to help refine user pain point can prioritize the features of the community rehabilitation health management system as well as improve the user's experience in the process of treatment and personal health management, helping researchers optimize and create value for the design research of the community rehabilitation health management system.

2   User research: analyzing user pain points from a demand perspective

In this study, users who need long-term community rehabilitation services are the research objectives. Non-invasive observation and questionnaire are used to observe and record the user's behavior in the process of receiving community rehabilitation services and conducting health management, analyzing the contact and the emotional experience [15] of target users in different scenarios of community rehabilitation health management. In the online health management process, users cannot clearly know their own health status and judge the effectiveness of health management and make timely plan adjustments. The user journey map of user health management is shown in Figure 1.
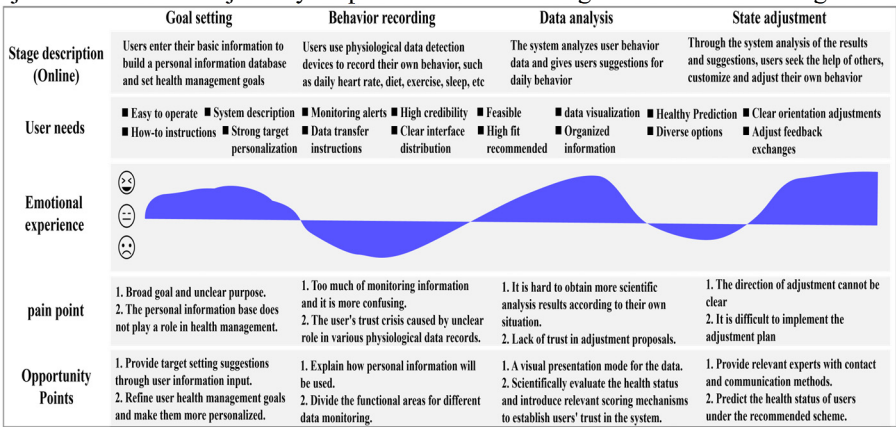
	Goal setting	Behavior recording	Data analysis	State adjustment
Stage description (Online)	Users enter their basic information to build a personal information database and set health management goals	Users use physiological data detection devices to record their own behavior, such as daily heart rate, diet, exercise, sleep, etc	The system analyzes user behavior data and gives users suggestions for daily behavior	Through the system analysis of the results and suggestions, users seek the help of others, customize and adjust their own behavior
User needs	▪ Easy to operate ▪ System description ▪ How-to instructions ▪ Strong target personalization	▪ Monitoring alerts ▪ High credibility ▪ Data transfer ▪ Clear interface instructions distribution	▪ Feasible ▪ High fit recommended ▪ data visualization ▪ Organized information	▪ Healthy Prediction ▪ Clear orientation adjustments ▪ Diverse options ▪ Adjust feedback exchanges
Emotional experience				
pain point	1. Broad goal and unclear purpose. 2. The personal information base does not play a role in health management.	1. Too much of monitoring information and it is more confusing. 2. The user's trust crisis caused by unclear role in various physiological data records.	1. It is hard to obtain more scientific analysis results according to their own situation. 2. Lack of trust in adjustment proposals.	1. The direction of adjustment cannot be clear 2. It is difficult to implement the adjustment plan
Opportunity Points	1. Provide target setting suggestions through user information input. 2. Refine user health management goals and make them more personalized.	1. Explain how personal information will be used. 2. Divide the functional areas for different data monitoring.	1. A visual presentation mode for the data. 2. Scientifically evaluate the health status and introduce relevant scoring mechanisms to establish users' trust in the system.	1. Provide relevant experts with contact and communication methods. 2. Predict the health status of users under the recommended scheme.

Fig. 1. User journey map of user health management

During offline medical treatment, users cannot match the appropriate diagnosis and treatment department according to their disease and make corresponding travel plans. In the process of diagnosis and treatment, it is hard to understand the professional medical terms and give doctors suitable feedback about treatment experience. The user journey of offline medical treatment is shown in Figure 2.
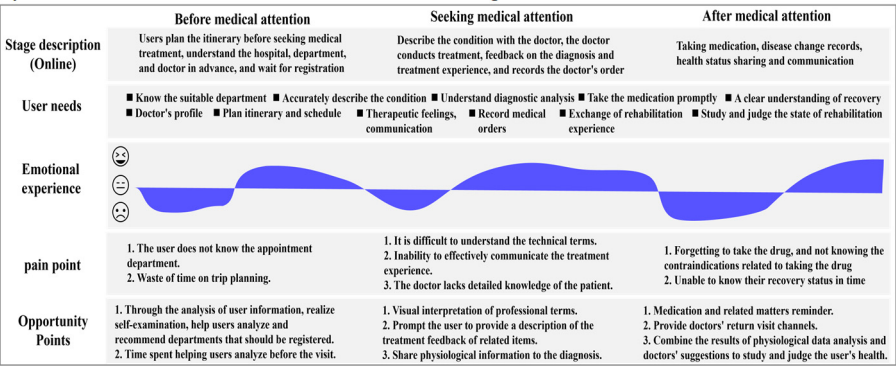
	Before medical attention	Seeking medical attention	After medical attention
Stage description (Online)	Users plan the itinerary before seeking medical treatment, understand the hospital, department, and doctor in advance, and wait for registration	Describe the condition with the doctor, the doctor conducts treatment, feedback on the diagnosis and treatment experience, and records the doctor's order	Taking medication, disease change records, health status sharing and communication
User needs	▪ Know the suitable department ▪ Accurately describe the condition ▪ Doctor's profile ▪ Plan itinerary and schedule	▪ Understand diagnostic analysis ▪ Take the medication promptly ▪ Therapeutic feelings, ▪ Record medical communication orders	▪ A clear understanding of recovery ▪ Exchange of rehabilitation ▪ Study and judge the state of rehabilitation experience
Emotional experience			
pain point	1. The user does not know the appointment department. 2. Waste of time on trip planning.	1. It is difficult to understand the technical terms. 2. Inability to effectively communicate the treatment experience. 3. The doctor lacks detailed knowledge of the patient.	1. Forgetting to take the drug, and not knowing the contraindications related to taking the drug 2. Unable to know their recovery status in time
Opportunity Points	1. Through the analysis of user information, realize self-examination, help users analyze and recommend departments that should be registered. 2. Time spent helping users analyze before the visit.	1. Visual interpretation of professional terms. 2. Prompt the user to provide a description of the treatment feedback of related items. 3. Share physiological information to the diagnosis.	1. Medication and related matters reminder. 2. Provide doctors' return visit channels. 3. Combine the results of physiological data analysis and doctors' suggestions to study and judge the user's health.

Fig. 2. User journey of offline medical treatment

The analysis of the pain points of the existing services of community rehabilitation and health management mainly determines the service products that need to improve the user experience by analyzing the participants of the relevant services and the support needed to complete the services. This includes the interaction between user behavior and foreground and background service personnel, as well as the support tools to complete the interaction, focusing on the contact points of service products in the process of service interaction. Build a service blueprint [16] as shown in Figure 3.
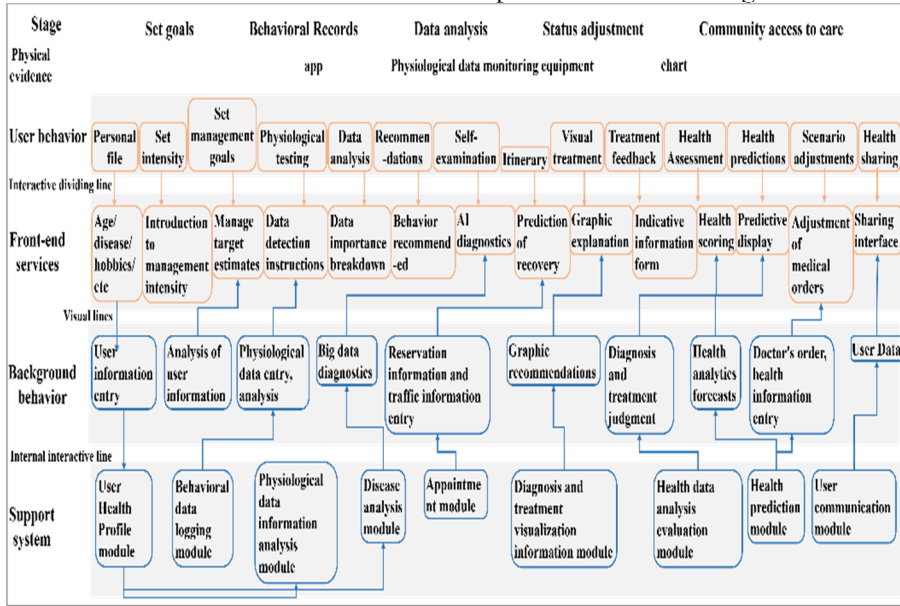
Fig. 3. Blueprint of community rehabilitation health management services

3   Health management system strategy construction based on kano model

3.1   Summarize the elements of original user needs

Based on the physical and psychological characteristics of target users, this study analyzed the behavior habits of patients in family health rehabilitation and community hospital treatment through semi-participatory observation and obtained 28 original needs of users for the service experience of community rehabilitation health management, as shown in Table 1. The original user needs with the same attributes are integrated and classified, and seven demand types are determined in the process of users experiencing the community rehabilitation health management system [17], which is shown in Table 2.

Table 1. Original demand information of target users

Description of the original requirements of the target user			
1. Real-name authentication registration	8. Exercise and diet recommendations	15. Doctors study and judge user data	22. Optimization of doctor profile
2. Fill in personal information	9. Monitor instructions for use	16. Adjustment and selection of health management	23. Predict the time of consultation
3. Fill in illness	10. Data importance division	17. Health status assessment	24. Itinerary and Recommendations
4. Determine the type of health management	11. Health assessment analysis	18. Experts/doctors analyze recommendations	25. Visual interpretation of diagnosis and treatment
5. Set the intensity of health management	12. Health Score	19. Prediction of health state development	26. Suggestive information feedback on treatment feelings
6. Set health management goals	13. Reference to relevant cases	20. Self-examination of the condition	27. Medication adjustment and reminder
7. Description of monitoring data	14. Share inquiries	21. Department recommendation	28. Doctor recheck

Table 2. Functional classification and integration of user requirements

No.	Specific needs	Requirements classification integration
①	1-Real-name authentication registration、2- Fill in personal information、3- Fill in illness、4- Determine the type of health management、5- Set the intensity of health management、6- Set health management goals	Set goals
②	7- Description of monitoring data、8- Exercise and diet recommendations、9- Monitor instructions for use、10- Data importance division	Behavioral Records
③	11- Health assessment analysis、12- Health Score、13- Reference to relevant cases、28- Doctor recheck	Health analytics
④	14- Share inquiries、15- Doctors study and judge user data、17- Health status assessment、18- Experts/doctors analyze recommendations、19- Prediction of health state development	Status assessment
⑤	16- Adjustment and selection of health management programs、27- Medication adjustment and reminder	Scenario adjustments
⑥	20- Self-examination of the condition、21- Department recommendation、22. Optimization of doctor profile、23- Predict the time of consultation、24- Itinerary and Recommendations	Prepare for medical attention
⑦	25- Visual interpretation of diagnosis and treatment、26- Suggestive information feedback on treatment feelings	Visual treatment

3.2   kano analysis of requirement elements

The study was conducted in the form of questionnaire, which was designed by integrating seven requirements in the user experience process. 287 electronic questionnaires were distributed online, and 265 valid questionnaires were collected. It was found that in the community rehabilitation health management system, the analysis result of the demand elements 'health analytics', 'status assessment', 'visualization treatment' are A (attractive attribute), accounting for 46.1%, 52.96% and 36.54% respectively and the 'medical preparation' is O (one-dimensional attribute), accounting for 27.38%. The analysis result of 'scenario adjustment' is M (must-be attribute), accounting for 26.41%, while 'set goals' and 'behavior record' are I (indifference attribute), accounting for 31.85% and 55.37% respectively. The analysis results are shown in Table 3 (the results are expressed in percentage).

Table 3. Kano model analysis results

Demand elements	Classification results
Set goals （S₁）	I （31.85）
Behavioral Records （S₂）	I （55.37）
Health analytics （S₃）	A （46.21）
Status assessment （S₄）	A （52.96）
Scenario adjustments （S₅）	M （26.41）
medical preparation （S₆）	O （27.38）
Visual treatment （S₇）	A （36.54）

We used better-worse coefficient analysis [18] to analyze the impact of reflective demand factors on user satisfaction, realizing the quantitative analysis of kano model and help improve the research results.

The calculation equation of better-worse coefficient is shown by the following:

$$Better/\,SI = (A+O)\,/\,(A+O+M+I) \tag{1}$$

$$Worse/\,DSI = -1*\,(O+M)\,/\,(A+O+M+I) \tag{2}$$

The SI value and DSI value calculation results of each requirement element are shown in Table 4.

Table 4. Sensitivity analysis of demand elements

Demand elements	SI%	DSI%
S₁	35.86	-15.73
S₂	32.31	-12.06
S₃	55.31	-17.59
S₄	65.53	-12.65
S₅	38.15	-26.03
S₆	59.74	-46.50
S₇	71.84	-10.62

The Better-worse coefficient scatter diagram for each requirement element is constructed by taking the SI value as the vertical coordinate and the DSI absolute value as the horizontal coordinate, which is shown in Figure 4. Considering the priority of user needs, the attributes are sorted in the following order: must-be attribute > one-dimensional attribute > attractive attribute > indifferent attribute [19]. According to the scatter diagram of the better-worse coefficient, the 'medical preparation' is in the first quadrant which means a one-dimensional attribute. The design of this demand can make the product superior to other competitors. 'Health analysis', 'status assessment' and 'visualization' belong to the second quadrant and are attractive attributes which can significantly improve user satisfaction. The 'state adjustment' in the fourth quadrant is a must-be attribute, and the lack of this requirement will significantly reduce user satisfaction. The rest of the requirements belong to the third quadrant of indifferent attribute, which has little impact on user satisfaction and can be omitted. Therefore, this study will be designed based on the above five user requirements except for the indifferent attributes.
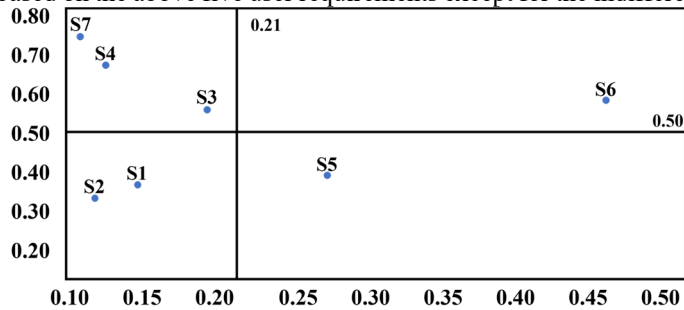
Fig. 4. Better-Worse coefficient scatter diagram

4   Design Practice of Community Rehabilitation Health Management System

With the analysis of the user satisfaction index, we will take the one-dimensional and attractive attribute as the basis to strengthen the community rehabilitation health management service and try to optimize the necessary attributes, which means in the study we are going to meet and optimize the 'scenario adjustment' needs, focus on the 'medical preparation' needs, try to highlight the 'health analysis', 'status assessment' and 'visual treatment' needs of the overall design, and guide the functional structure design of the community rehabilitation health management system.

4.1   Sort out stakeholder relationship and clarify APP function logic

The analysis and sorting of the relationship between stakeholders related to the community rehabilitation health management system can help improve the design logic of the study about health management system. Target users can detect and record physiological indicators by smart devices, and upload the records to the system to obtain pre-

liminary physiological health analysis data. During the treatment of community hospitals, doctors can query the user's health analysis data through users' permissions to help generate professional health analysis results and personalized medical orders. Community hospitals work with third-party partners to increase the number of application users through advertising and offline distribution, so as to meet the daily operating costs as well as obtain income to help hospitals improve and iterate the community rehabilitation health management system. The stakeholder relationship diagram is shown in Figure 5.
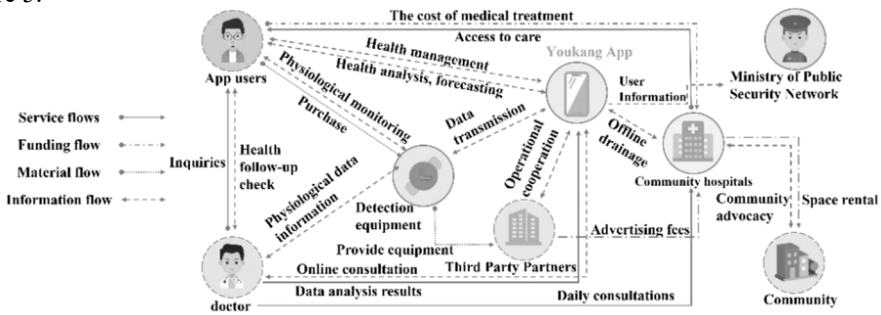
Fig. 5. Stakeholder diagram

Based on the priority analysis results of user demand satisfaction based on kano model, the mobile terminal framework of the community rehabilitation health management system is designed, and the design solution of the community rehabilitation health management system is formed. The design theme revolves around five modules: 'plan adjustment', 'medical preparation', 'health analysis', 'status assessment' and 'treatment visualization', and proposes the design strategy, design principles, information architecture and task flow, determines the product level, and finally carries out the visual interaction design of the interface to complete the high-fidelity model. The functional structure of YouKang APP is shown in Figure 6.
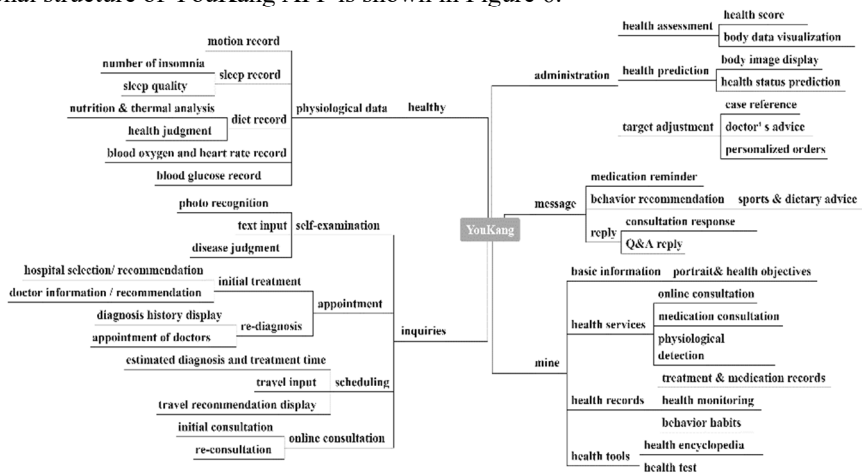
Fig. 6. Function structure diagram of health management APP

4.2   Matching medical departments and visualizing professional terms

The interface is divided into modules for self-inspection and formation arrangement in the form of card waterfall flow. AI diagnosis, uploading pictures and text description are set for self-inspection, with information prompt and guidance as the main methods to help users judge the information of diagnosis and treatment departments and make department appointments. The system relates to the community medical system to obtain the diagnosis and treatment appointment information and combine with the traffic conditions to form the diagnosis and treatment travel plan suggestions, helping users reasonably arrange the diagnosis and treatment travel to reduce the negative emotions caused by time waste. The self-examination and scheduling interface are shown in Figure 7.
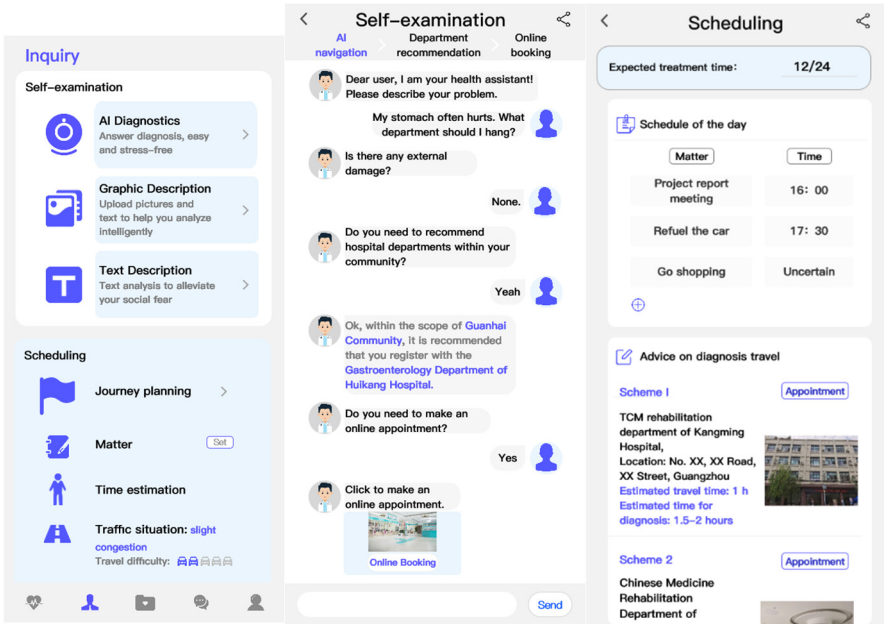
Fig. 7. Disease self-examination and itinerary interface

In the process of diagnosis and treatment, visual interpretation of medical terms is carried out to help users reduce cognitive difficulties and accurately understand their own health status, which can reduce users' anxiety about diseases as well as establish users' confidence in health management through diversified and multi-dimensional information output methods such as graphics and text. After the end of the treatment, a hierarchical list of sensory feelings involved in the treatment process is formed to help the user accurately describe the treatment experience, which will help avoid the information gap in the communication with the doctor at the same time facilitate the doctor to optimize the user's subsequent treatment service experience. The self-examination and scheduling interface are shown in Figure 8.

Diagnosis Visualization

Diagnostic results:
Mild fatty liver
CAP: 247db/m

CAP: Instantaneous elastic imaging technology detects controlled attenuation parameters, mainly used to reflect liver fat content

- Healthy liver::
  CAP<238db/m
  Fat content grade<10%

  Small droplets of fat.

- Mild fatty liver:
  CAP: 238–259db/m
  Fat content grade: 11%–33%

  Large fat droplets, hepatocyte expansion, nuclear translocation.

- Moderate fatty liver:
  CAP: 259–292db/m
  Fat content grade: 34%–66%

  Fibrosis of cell wall, inflammation of liver cells, low vitality.

- Severe fatty liver:
  CAP>292db/m
  Fat content grade>67%。

  Scarification of cell wall and hepatocyte death.

‹   Treatment feedback   ⌁

Treatment feeling feedback

Hoping to create a better experience for you through these questions, so please answer carefully!

Acid sensation	56
keenly feel	72
Itching sensation	29
Bloating sensation	44
Soothing degree	86
Acceptance	90
Overall feeling	95

Suggestion

If you have any suggestions for treatment, you can chat here!

Submit

Fig. 8. Visualized diagnosis and treatment feedback interface

4.3   Health analysis, evaluation, and optimization of health management programs

With the user's physiological analysis results recorded by intelligent detection equipment, the system will form a health trend curve to visualize the health status and help the users establish awareness of their health. Combined with the doctor's diagnosis results, prompt points are used to inform the user of the body part of the disease with corresponding medical advice to help the user find rehabilitation adjustment. The system provides health sharing and communication channels from the aspects of diet, exercise, medication, etc., for users to communicate with other users with similar experiences, help them find useful information related to themselves.

Optimize the health analysis through the doctor's diagnosis information can help predict health statue and obtain the change of the user's physiological data, which will establish the user's confidence in long-term health management and will also improve the system's user viscosity to assist the system's physiological data analysis, providing users with more accurate health analysis results and more personalized management solutions. When users adjust and select the health management intensity, the system will give the corresponding exercise, sleep duration, diet suggestions and diagnosis frequency according to the user's behavior characteristics. When users make customized adjustments, the system will help users make scientific adjustments to ensure the rationality and effectiveness of the user's health management overall. The health analysis, case reference, health prediction and program adjustment interface are shown in Figure 9.
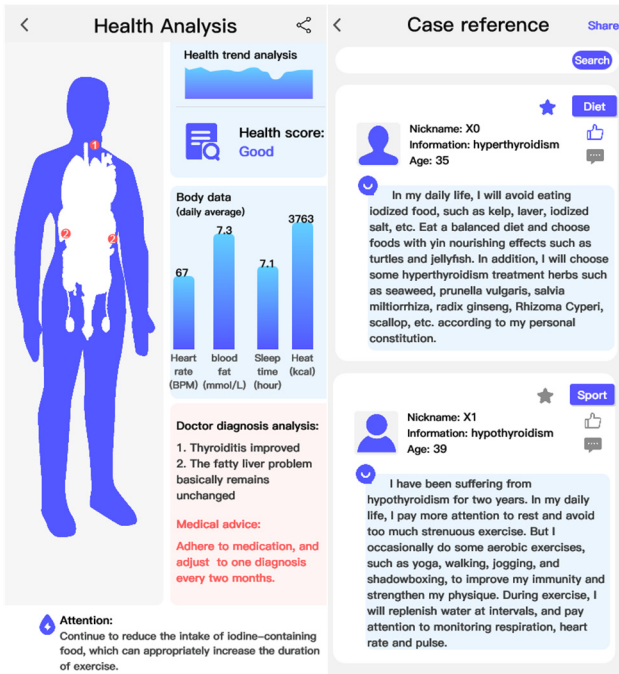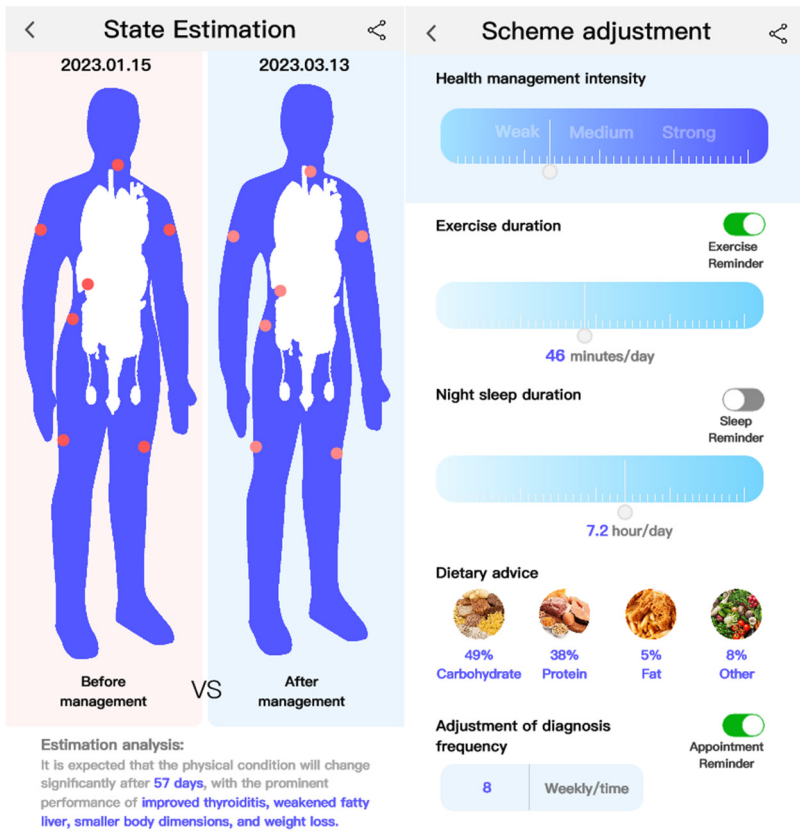
Fig. 9. Health analysis, case reference, health prediction and program adjustment interface

5   Conclusion

In this paper, we transformed the needs of community users in the process of receiving community rehabilitation services and health management, and prioritized user satisfaction with the help of kano model and refined the structure of the community rehabilitation health management system. We designed the high-fidelity prototype diagram in five modules, such as: 'scenario adjustment', 'medical preparation', 'health analysis', 'status assessment' and 'visual treatment', which can help improve the satisfaction of users in the process of community rehabilitation health management. The design results reflect the humanistic care of design. Although this study provides a reference for the construction and optimization of the design path of the community rehabilitation health management system, due to the large differences in communities in different regions, the relevant research work on the special community rehabilitation health management system will also become the focal point of future study.

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