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Application of Artificial Intelligence in Empowering Community-Based Health Education for Older Adults in the Context of Lifelong Education

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Abstract: With the intensification of population aging, the demand for health education among older adults is growing rapidly. Traditional approaches are increasingly inadequate in meeting the personalized and continuous learning needs of this population. Guided by the concept of lifelong education, this study explores the application pathways of artificial intelligence (AI) technologies in community-based health education for older adults. Through a combination of literature review and case studies, the study summarizes the practical forms and actual outcomes of AI-assisted health education. The findings indicate that AI, through tools such as voice assistants, health monitoring devices, and personalized content delivery, significantly improves the efficiency, interactivity, and adaptability of health education. It also enhances older adults' awareness of and capacity for health management. AI empowerment provides new solutions for health education in aging societies. Future efforts should focus on strengthening technological support and community collaboration to promote the development of an intelligent and sustainable health education system.

1. Introduction

Population aging has become a major social issue faced globally, and the trend is accelerating. Against this backdrop, China is experiencing particularly severe demographic aging. According to statistics released by the Ministry of Civil Affairs, by the end of 2024, China's population aged 60 and above had reached 310 million, accounting for 22% of the national total. Forecasts suggest that by approximately 2035, this figure will surpass 400 million, making up over 30% of the population. This shift signals China's transition into a stage of pronounced population aging [1].

With the continued growth of the elderly demographic, health concerns among older adults have become an increasingly prominent issue in the broader context of social development. In response, the Central Committee of the Communist Party of China and the State Council issued the Opinions on Strengthening Aging Work in the New Era in 2021. This policy elevated "healthy aging" to a national strategic priority and emphasized the importance of promoting high-quality development in

services related to the aging population [2]. The document advocates not only for strengthening the health service infrastructure for older adults but also for embedding healthy aging principles into all dimensions of economic and social planning. This policy framework offers clear strategic support for the integration of lifelong education initiatives with AI-assisted health education, thereby creating favorable conditions for implementing smart, community-based health education models for the elderly.

Traditional health education methods such as offline lectures and printed materials are frequently outdated, insufficiently interactive, and neither personalized nor sustainable. As such, they struggle to meet the growing needs of older adults for health knowledge, disease prevention, and self-management. Meanwhile, the rapid development of AI technologies in healthcare, education, and elderly services has opened up new opportunities for transforming community-based health education. Lifelong education emphasizes that education should be a basic right accessible to everyone at any time and place, promoting learning throughout the entire lifespan with a particular focus on continued growth during older adulthood. Based on this concept, this study explores specific applications of AI technologies in community-based health education for older adults, aims to develop practical models, and supports its argument through literature and case studies to verify the feasibility and actual effectiveness of these approaches.

2. Theoretical Framework and Literature Review

2.1 Overview of Lifelong Education Theory

The concept of "Lifelong Education" was first proposed by Paul Lengrand at the International Conference on Adult Education hosted by UNESCO in December 1965, where he systematically outlined the theoretical foundations of this approach [3]. He is thus regarded as the "Father of Lifelong Education." Lifelong education advocates breaking down the barriers between traditional and continuing education, promoting the integration of learning with daily life, and pursuing a harmonious unity of personal growth and social progress. Within this educational system, education for older adults plays a vital role by providing high-quality learning resources and environments, as well as dedicated facilities and venues, to support ongoing development in mental, cognitive, and social domains. By integrating national resources, the goals of “learning for the elderly,” “enjoying life,” and “contributing to society” can be realized, thereby facilitating the development of aging-related services [4].

Against the backdrop of active and healthy aging, integrating the concept of lifelong education into older adult education holds great practical significance. Health education, as a key subsystem of lifelong education, not only improves older adults’ health literacy and self-management abilities but also enhances social participation and overall quality of life.

2.2 Research on AI Applications in Health Education

In recent years, AI technologies have gradually penetrated the field of health education. Leveraging technical advantages in content generation, intelligent delivery, speech recognition, data analysis, and behavioral intervention, AI has significantly enhanced the personalization, intelligence, and accessibility of health education. The practical use of AI in health education for older adults is evident in several key areas.

Smart voice assistants, such as Baidu's “Xiaodu” and Alibaba's “Tmall Genie” are widely used in home environments and can provide elderly people with voice-activated question-and-answer services, health reminders, and medical information queries, thereby lowering the threshold for them to obtain health information [5].

Wearable devices, such as smart bracelets and smartwatches, which integrate multiple sensor technologies to collect real-time physiological data such as heart rate, blood pressure, and sleep patterns. This data is then uploaded to an app platform, allowing users or caregivers to view it at any time, thereby enabling personalized health management [6].

Intelligent recommendation systems, based on big data analysis and user profiling technology, these systems precisely deliver customized health education content to the elderly based on their health status, usage habits, and preferences, thereby improving intervention effectiveness and learning efficiency [7].

Related studies both domestically and internationally generally agree that the integration of AI technology effectively alleviates common issues in elderly health education, such as information fragmentation, communication barriers, and service management gaps, further promoting improvements in educational quality and health service optimization, and providing technical support for the construction of a smart elderly health education system [8].

3. Practical Models of AI-Enabled Health Education for Older Adults in Community Settings

Guided by the concept of lifelong education, the practice of AI-enabled community-based elderly health education should adhere to a senior-centric approach, leverage technological support, utilize community platforms, and integrate multiple resources to gradually build a multi-dimensional, collaborative, and sustainable service system. Based on domestic and international research and actual cases, this paper proposes the following three representative practice models.

3.1 The “AI + Personalized Health Education” Model

This model deeply integrates AI with wearable devices and IoT technology to create a closed-loop health service system that combines real-time monitoring, anomaly alerts, and personalized feedback [9]. By widely deploying devices such as blood glucose monitors, blood pressure monitors, and sleep monitors in the daily lives of the elderly, continuous and detailed physiological data collection can be achieved. The AI analysis engine rapidly identifies and processes the data, automatically generating warning signals when potential health risks are detected, and adjusting health education content in a timely manner based on the assessment results. This model achieves precise linkage between data and educational content, ensuring that health education is no longer isolated from management practices but becomes a key component in promoting proactive health management among the elderly.

3.2 The “AI + Smart Health Monitoring” Model

By leveraging AI technology's capabilities in deep learning and recommendation algorithms, it is possible to conduct multi-dimensional analyses of the health records, interests, preferences, and lifestyles of the elderly population, thereby developing personalized health education plans [10]. This model emphasizes the precise delivery of educational content, covering areas such as dietary nutrition, scientific exercise, medication management, and psychological adjustment. By constructing a comprehensive personal health data profile that integrates physical examination information, chronic disease history, and daily behavioral data, AI systems can continuously optimize user profiles for the elderly. Based on this, intelligent recommendation mechanisms can provide targeted learning content, supplemented by interactive platforms such as voice assistants, smartphones, and community electronic screens, to form a people-centered, dynamically updated continuous intervention pathway, achieving a transition from “universal” to “customized” education.

3.3 The "AI + Community Intelligent Service Platform" Model

Relying on community infrastructure, an AI service platform integrating health education, information integration, and intelligent scheduling functions is constructed to promote the formation of a multi-party co-construction mechanism featuring "government guidance, community hosting, university participation, and enterprise support"[11]. The platform system has multiple functional modules, including education course promotion, user interface interaction, data processing and analysis, and AI engine support, forming a sustainable service ecosystem. In terms of educational resources, high-quality content pools can be created through university teachers recording micro-courses, hospitals reviewing content, and enterprises providing technical solutions. In terms of service processes, the platform achieves a closed-loop operation through online learning appointments, offline activity participation, real-time evaluation feedback, and data-driven optimization. This platform not only focuses on the popularization of health knowledge among the elderly but also extends to areas such as intelligent diagnosis, psychological counseling, and interest courses, reflecting the "whole-person development" philosophy and systematic educational thinking advocated by lifelong education.

4. Case Studies

Driven by the concept of lifelong education, AI is bringing profound changes to health education for the elderly in communities. The following two practical cases demonstrate the exploration paths and achievements of different regions and institutions in the field of smart health education, providing valuable experience for reference.

4.1 Changning District, Shanghai: New Explorations of Integrating Health Education into Smart Elder Care

As a pioneer in smart aging in Shanghai, Changning District has actively promoted the application of AI in elderly health education [12]. The community's "unmanned senior dining hall" has introduced an AI-powered intelligent meal planning system, which designs personalized dietary plans based on seniors' health conditions and physical metrics. This not only ensures adequate nutrient intake but also helps seniors develop healthy eating habits, providing a vivid example for chronic disease prevention and nutrition education.

Additionally, Changning District leverages the "elderly care institutions + internet hospital" model to organically integrate telemedicine with health education. The elderly can communicate with doctors via video calls to receive personalized health guidance, such as chronic disease management, medication use, and rehabilitation exercise recommendations, significantly overcoming the time and space limitations of traditional face-to-face education.

At the community level, the "Shanghai Elderly Care Time Hub" digital platform has built a bridge of interaction between volunteers and the elderly, conducting health lectures, exercise guidance, psychological comfort, and other companion-based educational activities. This model strengthens the emotional connection of education, enhances the confidence and ability of the elderly to manage their own health.

4.2 Haidian District, Beijing: Integrated Services through the "AI-Powered Elderly Health Management System"

Haidian District has leveraged its abundant technological resources to build a comprehensive elderly care service system centered on the "AI-assisted elderly health management system." The

system integrates smart terminals, virtual assistants, and cloud platforms to form a dynamic perception and precise intervention mechanism for the health status of the elderly [13].

The virtual voice assistant "Funi" within the system not only proactively pushes personalized health knowledge but also answers health-related questions through voice dialogue, provides emotional support, and alleviates the psychological stress of elderly individuals living alone. This intelligent interactive format makes the elderly more willing to accept continuous health education and enhances their proactive learning attitude.

Intelligent care terminals widely deployed in community elderly care institutions provide differentiated health education and care guidance for the elderly based on health big data and care assessment results. This integrated hardware and software service model effectively addresses the shortage of frontline care staff, improves the efficiency of educational resource allocation, and expands the scope of health education services.

5. Challenges and Issues in Practice

In the practical implementation of AI-enabled community health education for the elderly, despite continuous advancements in technological methods, numerous challenges remain in actual promotion and application.

First, the overall digital literacy level of the elderly population is relatively low, and their understanding of AI technology is limited. Some elderly individuals find operating smart devices confusing, leading to a reliance on others or complete rejection of such technologies, which to some extent weakens the proactivity and accessibility of smart health education. Due to concerns about data security and privacy breaches, many elderly individuals hold reservations toward systems involving the collection and processing of health data, hindering the widespread adoption of AI tools.

Second, existing smart health education content often lacks specificity, resulting in a "mismatch between supply and demand." Many systems use templated, standardized educational modules that fail to adequately consider the individual differences and actual needs of the elderly in areas such as chronic disease prevention, psychological support, and rehabilitation training, thereby reducing the appeal and practicality of the educational content. Additionally, frontline community workers lack sufficient training in both technology use and health guidance, leading to ineffective implementation of AI tools and impacting educational outcomes.

Furthermore, the digital divide between urban and rural areas remains significant. In some rural and remote areas, weak network infrastructure and inadequate smart device configurations create a lack of digital health education environments, preventing the benefits of technology from reaching all elderly individuals. More critically, current policy frameworks do not yet provide comprehensive support systems. There is a lack of dedicated funding, industry standards, and legal safeguards. Many pilot projects rely heavily on external resources and struggle to sustain long-term operations, which limits the deep integration and broad dissemination of AI in community-based older adult health education.

6. Future Directions and Recommendations

To address the challenges outlined above, it is imperative to promote the coordinated development of AI technologies and community-based health education for older adults, under the guiding principles of lifelong education.

Firstly, efforts should be made to enhance digital literacy among older adults. Initiatives such as "smart device training workshops" and "health app navigation courses" can increase their acceptance and usage of intelligent tools, thereby strengthening their confidence and engagement in

smart health education.

Secondly, efforts should be made to promote the intelligent and personalized upgrading of health education content. Leveraging AI algorithms to build dynamic health profiles, educational resources can be precisely tailored to the physiological condition, psychological state, and lifestyle preferences of the elderly, thereby enhancing the relevance and practicality of the content. Additionally, healthcare professionals, education experts, and technology companies should be encouraged to collaborate deeply, establishing a multidisciplinary content co-creation mechanism to enhance the professionalism and interactivity of intelligent education platforms.

Thirdly, a comprehensive support system should be established to build a multi-stakeholder governance mechanism featuring "government guidance, university participation, corporate support, and community implementation." The government should introduce specialized policies to promote the development of smart health education, allocate dedicated funds, and establish evaluation and incentive mechanisms to ensure the continuity and effectiveness of project operations. Universities and research institutions can provide theoretical support and educational resources, while enterprises contribute technical R&D and platform maintenance, forming a complementary collaborative model.

At the same time, efforts should be made to bridge the urban-rural digital divide and promote the balanced allocation of smart health education resources. The government should strengthen the construction of grassroots network infrastructure, promote low-threshold, easy-to-operate smart terminal devices, and develop "offline-usable" and "voice-operated" functions suitable for the elderly to ensure that elderly people in remote areas can also enjoy high-quality health education services.

Guided by the concept of lifelong education, AI provides new development opportunities for community health education for the elderly. Through technological pathways such as intelligent recommendation systems, voice interaction assistants, and wearable devices, the dissemination of health education content has become more diverse, precise, and interactive, significantly enhancing the learning interest and health management capabilities of the elderly. Typical cases demonstrate that the application of AI not only optimizes the service process of health education but also promotes the transformation of the elderly from "passive recipients" to "active learners," thereby advancing the realization of active aging. However, current challenges such as high technical barriers to entry, insufficiently targeted educational content, and weak implementation capacity at the grassroots level continue to hinder the widespread adoption and deep integration of smart health education. Moving forward, it is essential to further uphold the principles of lifelong education, enhance digital literacy among all citizens, integrate high-quality resources, and establish a smart health education ecosystem that involves multiple stakeholders and integrates diverse scenarios. Through policy support, technological innovation, and coordinated service delivery, the deep integration of AI and community-based health education for older adults can be advanced, empowering more seniors to achieve healthy aging and lifelong education in the digital era.

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References

[1] Ministry of Civil Affairs of the People's Republic of China. (2025) From "Elder Care" to "Enjoying Old Age": Social Organizations Help Unlock the Happiness of the Sunset Years. Retrieved June 6, 2025, from https: //www. mca. gov.cn/n2623/n2684/n2703/c1662004999980004303/content.html

[2] The CPC Central Committee and the State Council. (2021) Opinions on Strengthening Aging-Related Work in the New Era. Retrieved June 6, 2025, from https://www.gov.cn/zhengce/202203/content_3635523.htm

[3] Zhang, Y. (2014) Paul Lengrand: Father of Lifelong Education. Education and Vocation, 28, 110–111.

[4] Liu, L. (2022) A Brief Discussion on the Theoretical Guidance and Practical Progress of Lifelong Education. Legendary Stories, 45, 114–116.

[5] Wang, E.Z. (2020) Research on Proactive Interaction Design Strategies for Conversational Agents in Smart Home Scenarios. Hunan University.

[6] Zhu, Y.Z. (2023) Analysis of the Current Application of Wearable Devices for the Elderly under the Background of Smart Elder Care. Science & Technology Innovation and Application, 13(5), 151–155.

[7] Xu, J.H. and Wang, J.P. (2023) Development of an eHealth Literacy Education Index System for Older Adults Based on Smartphones. Nursing Research, 37(9), 1562–1567.

[8] Li, S.H., Song, Y.F. and Li, D.M. (2025) Digitalization of Elderly Education Abroad Since the 21st Century: Evolution, Hotspots, and Trends. Education and Vocation, 1079(7), 88–95.

[9] Lopez-Barreiro, J., Garcia-Soidan, J.L., Alvarez-Sabucedo, L., et al. (2024) AI-Powered Recommender Systems for Promoting Healthy Habits and Active Aging: A Systematic Review. Applied Sciences, 14(22), 10220. https://doi.org/10. 3390/app142210220

[10] Xie, Y., Lu, L., Gao, F., et al. (2021) Integration of AI, Blockchain, and Wearable Technology for Chronic Disease Management: A New Paradigm in Smart Healthcare. Current Medical Science, 41(6), 1123–1133. https://doi.org/10. 1007/s11596-021-2395-4

[11] Cui, X.G. (2023) Policy Basis and Action Framework for Constructing Micro-Courses in Elderly Mental Health Education. Journal of Guangzhou City Polytechnic, 17(4), 58–62.

[12] Shanghai Municipal People's Government. (2024) Changning's Smart Elder Care: So Much Wisdom. Retrieved June 6, 2025, from https://www.shanghai.gov.cn/nw15343/20241121/a44d3b832f95432b8e73e1c42763f9dd.html

[13] Haidian News. (2024) Haidian District: Smart Elder Care Boosts Senior Well-Being. Retrieved June 6, 2025, from https://www.bjwmb.gov.cn/wmdt/hdq/10077636.html