Implementation of Oral Healthcare Web System for Prevention of Elderly Dementia

Kyung-Oh Lee¹, In-Ae Kang², Yong-Keum Choi³

¹ Department of Computer Science and Engineering, Sun-Moon University, 70 Sunmoon-ro 221, Tangjeong-myon, Asan-si, Chungcheongnam-do, Republic of Korea

² Department of Computer Convergence Electronics, Sun-Moon University, 70 Sunmoon-ro 221, Tangjeong-myon, Asan-si, Chungcheongnam-do, Republic of Korea

³ Department of Dental hygiene, Sunmoon University, Sun-Moon University, 70 Sunmoon-ro 221, Tangjeong-myon, Asan-si, Chungcheongnam-do, Republic of Korea

Abstract— the number of elderly people in Korea is rapidly increasing to advance an aging society. Dementia causes many problems in the aging society but older people usually do not receive effective dementia prevention services because of their low economic power. For the elderly who are experiencing low dental clinic visits due to lack of economic power and education, various services have been developed through the web to help prevent oral healthcare and dementia of the elderly, and a web system has been developed to help oral healthcare and dementia of the elderly. This web system was developed based on the research result that if activating cognitive-behavioural function by strengthening chewing function and oral muscle function exercise of elderly people can prevent dementia or slow dementia progression and it is composed of content utilization module and oral healthcare diagnosis module. PHP 7.1.6, CSS, Notepad++, Bootstrap, Filezilla, and others were used to develop the web system. XAMPP 3.2.2, PHP 7.1.6, Apache2.4.25, and Mysqld 5.0.12 were used to build the server for the content service. In the long run, this development will reduce the social costs that government offices use to prevent dementia and to treat and maintain oral healthcare.

Keywords— Elderly people, Oral web system, Dental Application, Dementia prevention, older adults Dental care.

I. INTRODUCTION

The elderly population is rapidly increasing due to the development of modern medical technology, changes in the social welfare system, and increased life expectancy due to improved nutrition management. [1] According to statistics from the National Statistical Office, the number of elderly people aged 65 or over in 2019 is 7,685,000, which is 14.9% of the total population. This figure shows that Korea has entered a super-aged society beyond an aging society.

As the elderly population grows, dementia, one of the representative multiple disabilities, becomes an unavoidable social issue. Symptoms of dementia are markedly impaired in interpersonal relationships and social activities due to the

difficulty of daily living, as the cognitive function of memory, judgment, reasoning, and computational ability is significantly decreased. [7] Dementia is a disease that causes long-term pain and poor quality of life for patients as well as those around them.

To date, there is no definite treatment for dementia, so the only treatment is to relieve symptoms through prevention and rehabilitation.

This study developed a web system for preventing dementia of the elderly and this will complement various problems such as dementia rehabilitation costs and patient data management. For this purpose, information from the oral medicine field was used, and IT technologies related to web system development, database server construction, and content production were used in a fusion.

[8], [9] A questionnaire on a professional diagnosis of dementia was established. Based on the results of studies chewing function on dementia in elderly, it is important to strengthen chewing function and muscle function of elderly people with dementia. There is a correlation between dementia and oral healthcare on cognitive function. Also, patients' individual data management and games and oral Pilates videos for dementia prevention were produced, and considering the mobility and time and space accessibility of the elderly and demented elderly people, it made them use the effective dementia prevention management system with their PC.

II. RELATED RESEARCH

The core of prevention and treatment of dementia is the process of generating memory through repetitive exercises, which can activate brain function. [14] Disadvantages of traditional repetitive cognitive training programs [13] are the fixed involvement and treatment time of speech therapists and the need for repetitive training.

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 11, Issue 05, May 2021)

To solve these problems, mediation programs based on mobile devices and computers are increasing. Mobile devices and computer-based cognitive training programs make it easier to control the level of difficulty than traditional repetitive cognitive training programs and, without the therapist intervention, the caregiver or patient can perform individualized cognitive training according to the patient's dementia stage.

[12] The program developed by Kim Myung-sook is performed through games such as Stroop, remembering flower cards, match games, and making multiple numbers by using CoCoTa and the main goal is to focus on cognitive areas such as memory, attention, language skills, and computational skills.

[3] The non-wearing sensing technology developed at Kyungwoon University provides a customized test system to patients with database management and remote control system for a group of 4 patients per work therapist through a technology called VR.

[5] The dementia patient management program developed by Sookmyung Women's University, using a Leap Motion sensor, improved the management and efficiency by combining the 3D finger motion scan with the dementia rehabilitation program in various facilities.

While the above-mentioned studies are focused on improving the cognitive function of the traditional program, the web system for preventing the dementia of the elderly developed in this study is based on the correlation between dementia and oral healthcare as well as improving the cognitive function and it provides various contents for diagnosis, prevention and prescription of dementia and it contains oral Pilates video content that cannot be seen in other systems. The system also stores and manages individual data to make content available to individuals with dementia levels. Also, considering that the user is a dementia patient or an elderly person, it was developed to continuously manage the contents for easy operation.

III. IMPLEMENTATION

A. Web System Analysis

The web system for preventing dementia developed in this paper collected various contents for improving the oral healthcare and cognitive function of the elderly and digitalized the contents in various forms using multimedia technology. In this project, the dental hygienist participated to provide the accumulated knowledge and developed the web system so that general users can easily use it anytime and anywhere and database technology, content production, and service technology has been used in convergence.

The detailed configuration of the web system is as follows:

- The web site is composed of educational content utilization module, oral healthcare diagnosis module, and expert advisory module
- PHP 7.1.6, CSS, Notepad ++, Bootstrap, FileZilla, XAMPP 3.2.2, PHP 7.1.6, Apache 2.4.25, Mysqlnd 5.0.12, etc. are used to build a server to serve content
- The Database contains multimedia content related to oral healthcare for the elderly, diagnostic data for oral health for the elderly, data related to personal health for the elderly, and oral specialists and dental data.

Figure-1. Web System Detailed System Configuration

B. System Development Design Planning

The structural diagram of the web system developed in this paper is as follows.

Figure-2. Web System Structure Diagram

To manage the state of the elderly individual, the contents of the web system are made available by using login. After login, the dementia diagnostic test can be started to access games and oral Pilates images.

Figure-3. Main Screen

Figure-4. Login Screen

Figure-5. Oral & Dementia Questionnaire

Figure-6. Questionnaire Results

Figure-7. Oral Pilates Screen

Figure-8. Dementia Prevention Game Screen

Figure-9. Game Result Screen

Figure-10. My Page

- Figure-3: The first screen consists of simple phrases about the relationship between oral healthcare of teeth and dementia, and the start button.
- Figure-4: Users must login to use the contents of the web system.
- Figure-5: Questionnaire for dementia diagnosis and oral condition.
- Figure-6: After completing the questionnaire, if you press the Save button, your diagnosis status is managed in a database, and you can play games and oral Pilates according to the diagnosis status.
- Figure-7: You can watch and follow 4 different Oral Pilates training videos, and manage oral healthcare and dementia prevention.
- Figure-8: Matching pictures to improve memory and the system provides 10 points if matched, and -5 points if unmatched.
- Figure-9: The score of the game is displayed and you can see your ranking.
- Figure-10: Shows your oral condition and dementia stages, and displays your stages at a glance by displaying them in character or graph form.

IV. CONCLUSION

In this study, the cognitive function reinforcement system of oral rehabilitation concept was developed by applying IT technology and these research challenge can lead to new convergence studies. Also, the system is expected to contribute to reducing the social burden of dementia elderly health, preventing and managing elderly problems.

This application development is a new approach to improve the chewing and oral muscle function in the field of dental hygiene, thereby improving the cognitive function of the elderly and this application can be used as an oral rehabilitation training program because it was implemented to perform oral rehabilitation training and cognitive training applied to the actual treatment method mainly used in clinical practice, such as dentistry.

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 11, Issue 05, May 2021)

By combining the general cognitive rehabilitation treatment and prevention field of the demented elderly, oral healthcare field, and IT field, this application can be easily used by the elderly who are in the socially disadvantaged group.

Acknowledgement - This research was supported by the MISIP(Ministry of Science, ICT & Future Planning), Korea, under the National Program for Excellence in SW)supervised by the IITP(Institute for Information & communications Technology Promotion)

References

- [1] National Statistical Office of Korea
https://kosis.kr/statisticsList/statisticsListIndex.do?menuId=M_01_01&vwcd=MT_ZTITLE&parmTabId=M_01_01&outLink=Y&entrType=#content-group.
- [2] Jin-Ah, Lee. 2016. An Exploratory Study on Development Strategies for Dementia Policy., Journal of Digital Convergence 14.11 Korea. pp.71-79.
- [3] Jung-eun Lee., Il Sun Ko., 2018. The Relationship of Caregiving Appraisal and Family Function among Senile Dementia Patients' Families using In-home Services for the Long Term Care Insurance., Korea Convergence Society 9.8 Korea pp.319-330.
- [4] Hojin Choi, Seung Hyun Kim., 2018. Policy of national responsibility and dementia care., Journal of the Korea Medical Association, 61(5), pp. 309-313
- [5] Kyung-Lhi Kang., 2018. " Association between dementia and oral health." Journal of the Korean Dental Association 56.4 pp 218-230.
- [6] Eun-seo Jung Yoon-young Choi, Kyeong-hee Lee., 2019 " A qualitative study on the present conditions and problems of oral health care in senile dementia patients", Journal of Korean Society of Dental Hygiene .,19.4 , 601-614.
- [7] Hye-Bin Go, Min-Gyeong Kim, Jin-Young Kim, Hyun-Soo Kim, Young-Seo Park, Seung-Hyeon Seo, and Soo-Jeong Hwang. 2016., "The relationship between dementia and oral health in some elderly in Daejeon". Journal of Dental Hygiene Science, 16(6), 481-487.
- [8] https://www.nid.or.kr/support/hi_list_1.aspx
- [9] Young-Ju Cho, Hye-Suk Kim., Jin-Hyuk Kim. 2016. " The Development of Brain Health Care Game Applications to prevent Digital Dementia." Journal of the Korea Society of Computer and Information., 21.12 , 51-58.
- [10] Seong-Min Yun, Hyo-Sun Choi, Myeon-Gyun Cho., 2014, Integration of Application Program for Dementia Diagnosis using Biometric Sensor and Oxygen Chamber., Korea Academy Industrial Cooperation Society, 15(5), 2953-2961.
- [11] Jaewhan Yoo O, DoHyun Ahn , SeungHo Choun , Sung-Phil Heo (2019). Dementia Care System Using Virtual Reality with Non-wearable Sensing Technology, Journal of The Korea Society of Computer and Information. 27(1), 79-82.
- [12] D Development of Health Care System for Elderly People with Dementia Based on Leap Motion Sensor Ji-Woo Shin · Ji-Soo Kim · Gwang-Soo · Byung-Gyu Kim* Dept. of IT Engineering, Sookmyung Women's University, Seoul 04310, Korea