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Three Month Trial of Networked System that Improves Quality of Life of the Elderly

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Abstract

Japan has a rapidly aging population, and is now facing various problems related to nursing care. One key problem, the rapid increase in insurance payments for long-term care, was tackled by reforming the insurance system to emphasize preventative care in April, 2006. It has become increasingly urgent to prevent elderly people from falling ill or needing nursing care, and thereby reduce doctor visits, and ultimately to contain the expenditure on medical care for the elderly. However, we don't have enough preventative-care specialists. In order to offset the shortage of these specialists, we have developed a support system to provide the elderly with scientifically proven instruction using broadband and video-communication technologies. A three month trial of the system at a day-care center for the elderly people in need of care is described. The results show that the support system provides effective exercise guidance.

Keywords:

nursing care, prevention, Internet, video-communication

Introduction

Japan's aging society continues to grow. Last year, the number of people 65 or older reached 25.60 million or 20.04％of the population [1]. It has become increasingly urgent to prevent elderly people from falling ill or needing nursing care. However, we don't have enough preventative-care specialists.

The proposed system aims to prevent the elderly from becoming bedridden due to the "old-age syndrome", which frequently triggers falls, broken bones, poor nutrition, incontinence, and home confinement[2]. The shortage of care-givers means that only a small percentage of the elderly are receiving the support they need. In response, we had developed a support system that exploits the features of video-related technologies including video streaming and multipoint videoconferencing. This system is an extension of a home-participation type care-prevention system developed in 2003 that was geared to self-sufficient elderly persons. The effectiveness and usefulness of the system led to the work described in this paper.

Methods

The support system

The support system consists of the care-prevention servers and the client PCs (including PC for management). The servers include a database server (A), a content-storage server (b), a WWW server (C), a video –delivery server (D), and a Video conferencing server (E), as in Fig. 1. Scientifically proven instruction contents are stored in the content-storage server and delivered to each client by the video-delivery server over the Internet at the appointed time.

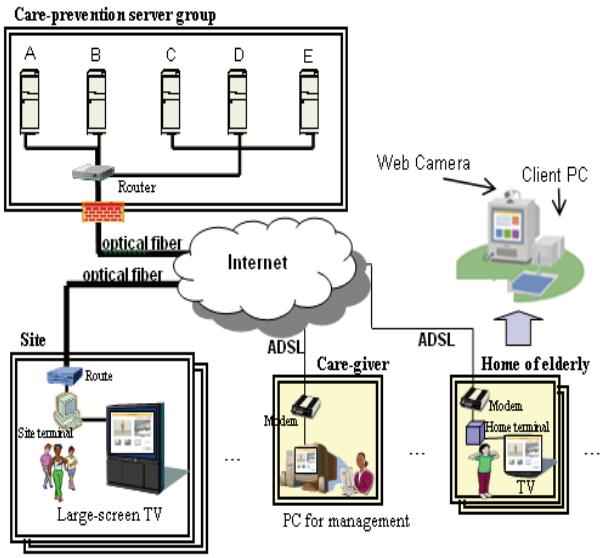

Figure 1 - Configuration of the system

The exercise for people requiring nursing care has 8 levels. The initial level is very relaxed, and the increments in difficulty are small. This allows training without strain.

1 http://www8.cao.go.jp/kourei/english/annualreport/2006/06wp-e.html
2 S. Murata, T. Tsuboi,T. Ito, K. Fujimura and H. Sato, " Development of System for Reducing the Need for Nursing Care," NTT Technical Review, Vol. 4, No. 2, p.60, 2006

The exercise contents are tagged with metadata enabling the exercise scenarios delivered to each site to be optimized to suit the current physical condition of the participant. In particular, the system can ask each participant for back pain, knee pain, and pain in the thighbone before the exercise session and then select exercises that do not overburden the knee, for example, for individuals experiencing knee pain. It can also deliver content with commentary targeting individuals or sites that desire more detailed exercise scenarios.

The client system consists of a web camera, a microphone, a speaker, and a PC. The web camera is used not only for video-conferencing but for recording of the user's movements. The recorded video is sent to the database server when the PC is shut off. Care-givers at remote locations can monitor the exercise classes and review the exercise videos of participants so they can offer them encouragement or tips via net-consultation or video mail.

Sometimes, elderly people or care-givers are not accustomed to PCs. To solve usability problems, the client system starts automatically when the user powers up the client PC. In addition, most operations require only simple button pushing.

Three month trial

To test the effectiveness of the system, we held a three month trial. Trial participants were the attendees of a day-care center, Care Port Yahata, Shizuoka, Japan. The 20 minute classes were held after lunch and each class consisted of exercises that were to be performed while sitting on a chair.

Check-up items were as follows:

1. Measurement of physical fitness:

- grip strength
- balance on one foot (with eyes open)
- walking speed (5 meters)
- knee extension power
- functional reach

2. Interview: iADL according to the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG Index of Competence[3])

- Basic self-sufficiency: the ability to go out by bus or by train alone, buy articles for daily use, prepare a meal, pay bills, deposit and withdraw money
- Intellectual activities: the ability to fill out forms, on a routine basis, read newspapers, read books or magazines, and demonstrate interest in TV programs or news articles on health issues.
- Social role: visit people, offer advice to family and friends, go to see someone in the hospital, speak to younger people.

Results

Outline

Forty seven people (men and women) participated; they were given check-ups before and after the trial. Over the 3 month trial, the average participant used the support system 12.6 times (about once a week).

Results of the measurement of physical fitness

There was a significant improvement in leg strength (knee extension power). Leg strength improved by 30% on average; about 60% of the participants showed some improvement. Fig. 2 shows the results of the measurement.

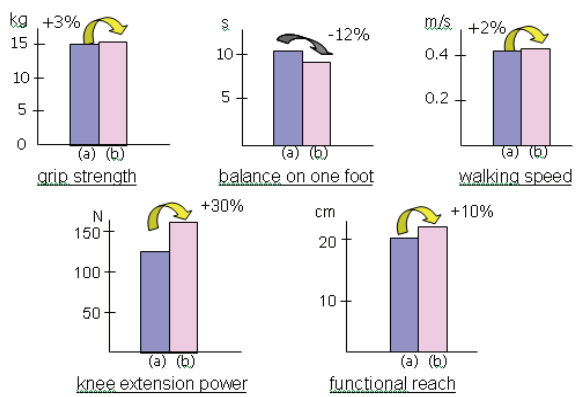

Figure 2 - Results of the measurement of physical fitness

Results of the interview (iADL)

Almost all interview items showed some improvement as shown in Fig. 3; the improvement in intellectual activities was significant at 13%.

3 Koyano W, Shibata H, Nakazato K, Haga H, Suyama Y, "Measurement of competence: reliability and validity of the TMIG Index of Competence." Arch Gerontol Geriatr, 13: 103-116,1991

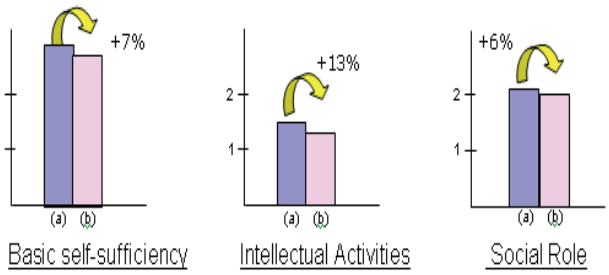

Figure 3 - Results of iADL

Conclusion

While it is hard for the elderly who need nursing care to keep up their strength, the results demonstrated a significant improvement in leg strength and iADL after the three month exercise.

The proposed support system has been proven to be effective for those who need nursing care. It can be expected to not only solve the shortage of preventative-care specialists but also reduce the need for and costs of nursing care.