Healthy Buildings for Older Adults

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Summary: In order to design a healthy building for the increasing group of older adults, consideration should be given to their impairments and disabilities resulting from the normal ageing process or diseases. For that purpose two approaches are available, i.e. architecture and technological solutions. Healthy buildings for older adults are expected to delay the demand for care and improve independent living. This could ease the strain on the health care system and reduce the medical expenses. Our broadened concept of healthy buildings will be applied within the project Technology@Home. A total of 5 dwellings will be designed and built for specific groups of older adults, and evaluated in terms of effectiveness, usability, user preference and installability.

Keywords: Older adults, independent living, assistive technology
Category: Architecture for healthy environment

1 Introduction
The population in the Industrialised World is subject to a demographic change resulting in an ageing society. The increasing number of older adults (EU 2004: 16.5% >65 years) wants to maintain physical independence, autonomy and quality of life, which is also expressed in the desire to remain living independently up to a high age, even when health is already declining [2]. The progressive ageing of society increases the demand for care and assistance in daily life. A considerable part of people of 65 years and over contend with various impairments and disabilities. The desire to remain living independently leads to home modifications, moving, or simply living under less favourable conditions that might pose a hazard to the quality of life. At the moment, between 40 and 65% of older adults are living in dwellings that do not fit to their conditions.

For the increasing group of older adults, supportive living environments (healthy buildings) are expected to delay the demand for both professional and informal care, and to improve independent living. Such living environments could ease the strain on the demand for professional carers and reduce expenses; medical expenditures are becoming a serious problem in our ageing and hazing society.

For the increasing group of older adults the concept of healthy buildings should be broadened. In this paper we express our view on healthy buildings for the aged and ageing.

2 Healthy buildings for older adults
Traditional housing concepts for the elderly are mainly based on culture, demographic situation, and policy of the country. Unfortunately, little attention is given to the specific needs regarding health and care in terms of building integrated solutions. To meet the desires of the current older population instead, older people turn to receiving home care and the use of additional medical aids to compensate for their decline in health. The concept of healthy buildings for older adults, however, offers these integrated solutions, giving older people the feeling of living in an ordinary house in stead of in an assisted living facility or a nursing home. Moreover, it will reduce, to some extent, the total care costs.

When designing healthy buildings for the aged, consideration should be given to their impairments and disabilities that result from the normal ageing process, such as impairments in hearing, vision, the neuromusculoskeletal system and cognition [3], or specific chronic illnesses.

To realise a healthy and supportive living environment for older adults, technology is of great value. Two approaches are available; (i) special architecture solutions, and (ii) particular technological solutions [1].
2.1 Architecture solutions

Architecture solutions cover basic conditions within healthy buildings for older adults.

A large number of seniors contend with decreasing mobility. Architecture solutions can improve the accessibility of buildings for people with functional limitations. Functional performance can be increased by modifications, such as barrier-free and widened entrances, the installation of grab bars, and the adaptation of kitchens and sanitary units [4]. Our homes should be designed with a surplus of flexibility in the floor plan, to allow for modifications in the early stages of the disablement process.

Indoor environmental quality is also a parameter of importance, since environmental conditions can prevent the development of, or alleviate, impairments or disorders. Older adults generally have a decreased activity level and a greater sensitivity to temperature extremes. Moreover, various illnesses lead to changes in metabolism. All will benefit from a good control of their thermal environment. People with chronic lung disease will have advantage of an excellent indoor air quality. Older people with declining vision and hearing can profit from comprehensible lighting and acoustical strategies.

The architectural concept of healthy building includes more than just the domestic environment. Supportive urban planning also gives a sense of independence and autonomy. The availability of facilities, such as supermarkets, post offices, and health centres, in the neighbourhood is desirable. Public green spaces that are nearby and easy to walk in should be further emphasised in urban planning, since they positively influence the longevity of urban senior citizens [5].

2.2 Technological solutions

Older adults see the use of technology as a solution to facilitate independent living [6,7]. Technology can compensate individual functional limitations that are a result of the normal ageing process, disease, or disability [8].

The wide range of technological possibilities to support independent living in a healthy building for older people is shown in Figure 1, which depicts the Health Smart Home [1]. The Health Smart Home is equipped with (i) assistive technologies and devices that are not connected to the network, and (ii) state-of-the-art ICT-solutions connected to a home network.

Assistive technologies and devices that are not connected to the network, such as devices for movement assistance or automatic kitchen equipment, can improve functional performance of older people. The ergonomics of assistive aids, household items and appliances contribute to independent living and autonomy.

The incorporation of comprehensible state-of-the-art ICT solutions into healthy buildings for older adults is fundamental in the homes of the future. Packages and services supporting health, safety, communication, and leisure are connected to the home network. To encourage quick response, the home network should be connected to a care centre that includes medical staff, carers, assistance and security.

Within the healthy building, the package ‘diagnostics & health monitoring’ appeals to one’s imagination most. This package includes the monitoring of vital parameters or behaviour, and even advanced chemical analysis and diagnostics. Tools for diagnostics and health monitoring can be used to facilitate care, for example by telecare/telemedicine and home health monitoring. To allow telecare, video links connected to a care centre are already being used [9]. Various methods have been developed in order to support health monitoring, including the monitoring of body temperature, body movement and respiration during sleep by the use of electrodes placed on the pillow and bed sheet, the recording of electrocardiogram (ECG) by electrodes in the bad tub, and the measurement of body weight and weight of urine and faeces via the toilet seat [10]. One step beyond home health monitoring are technologies for diagnostics, in which registered data are judged by a medical expert. For obvious reasons, skilled and complicated procedures are unacceptable, as is any discomfort. The sensors used should be non-invasive, reliable and
sustainable, easy to maintain in case of defects, and able to identify and communicate with the user [11]. Particularly in areas with low density of professional carers, telecare will offer a solution, because of reduced travel costs and saving of time [12].

The assistive technologies that are connected to the home network include systems for movement assistance, fall prevention and indoor navigation, along with devices for physical rehabilitation and fitness. Additionally, these technologies allow for self-management, providing services for shopping, banking and dressing.

The package ‘automation and control of the home environment’ can support indoor environmental control, e.g. temperature, ventilation and lighting, but also home security devices or automatic kitchen equipment. This package is also responsible for the control of individual needs, lifestyle and demand for care.

Information and communication devices supply information to, and allow communication with, the care centre, and transfer data, images and sound.

Leisure devices give comfort to people living alone, and even enhance social networks. Moreover, these devices can provide cognitive stimulation and distraction.

3 Technology@Home

At present, numerous pilot projects of healthy buildings for older adults are being initiated worldwide. Only a limited number is being used for research purposes. Moreover, most pilots aim exclusively at architecture solutions or technological solutions. An integral approach is necessary for the success of the pilot. However, these pilot projects aim at the normal ageing processes in particular. Since a unnegligible percentage of the older population copes with one or more chronic illnesses, it is of the utmost importance to account for the impairments that arise from specific diseases.

Our broadened concept of healthy buildings will be applied within the project Technology@Home (Technologie Thuis Nu!). A total of 5 dwellings, which incorporate both architecture and technical solutions, will be designed for specific groups of older adults. A mock-up of these dwellings will be built in a laboratory setting in Woerden, the Netherlands by the end of 2006. The integrated solutions will be evaluated in terms of effectiveness, usability, user preference and installability. Knowledge gained in the project will be disseminated by the front-office among the profit groups, professionals in care and (building services) technology, policy makers, product developers and, of course, scientists.

The 5 profit groups are (i) the vital ageing individual, (ii) older people with decreased mobility, (iii) older people with low vision, (iv) older people with chronic lung disease, and (v) older people with dementia. However, the informal carers, including spouses and relatives, as well as professional carers, will also benefit from the healthy building.

The dwelling for the ageing individual focuses on safety and comfort. In this dwelling, adaptation to individual needs should be a matter-of-course. At the same time, the architecture should account for the adaptability of the dwelling to future needs.

Older people with decreased mobility ask for a living environment that is easily accessible and facilitates optimal functional performance. The definition of accessibility heavily depends on the individual needs and capabilities. However, one could think of the installation of handrails and hoists, or the application of state-of-the-art devices for movement assistance and indoor navigation.

In the home environment for older people with low vision, sophisticated lighting strategies and color schemes are essential for providing information about the environment, which contributes to fall prevention and target localisation. Additional indoor navigation technologies enhance way-finding.

In the dwelling for older people with chronic lung disease, more specific COPD, special attention is given to indoor air quality. Moreover, the dwelling should be adapted to the decreased physical performance of the focus group. Home health monitoring enabling early recognition of exacerbations and swift follow-up and treatment is beneficial to the health of these people.

People with dementia are expected to benefit from a specially adapted domestic environment, of which the physical design provides a continuous source of cueing. The home for older adults with dementia should decrease behavioural disturbances, improve safety and provide technologies for activation and leisure, which at the same time can decrease carer burden.

4 Conclusion

Healthy buildings for older adults can not be realised by creating a healthy indoor environment alone. In order to design healthy buildings for older adults, consideration should be given to the impairments and disabilities resulting from the normal ageing process or specific diseases. These healthy buildings should offer sufficient flexibility to allow for adaptations to future needs. Architecture and technology offer a wide range of solutions to facilitate independent living.

References