Healthy housing for active aging

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J.E.M.H. van Bronswijk, Healthy housing for active aging, Gerontechnology 15(4):187-191; doi:10.4017/gt.2016.14.4.001.00 **Purpose** Showing the importance of life-long healthy and suitable housing for enabling active aging. **Results & Discussion** Following the 'active aging' definition of the World Health Organisation, housing is discussed as a preventer of chronic morbidities and an enabler of physical, mental and social health needed for an active daily life, also from a comparative international perspective.

Keywords: housing, active aging, chronic morbidities, gerontechnology

Anthea Tinker in this issue states¹: "Home can provide a sense of identity, a place of privacy, a focus of security, a site of key relationships and a point of orientation in relation to what may be a chaotic world outside". But housing is also a protector against noxious environmental exposures causing chronic morbidities. Housing services provide the immediate enabling environment.

Housing is our life-long companion, and even more so for the aged. In the USA, for instance, independently living older adults spent most of their time at home. Time spent on house-bound activities tend to increase with age (Table 1). For retired US citizens, leisure at home is mainly watching TV; on the average a third of the time when awake². Just passively watching TV is not in line with the concept of active aging as defined by the World Health Organisation: "Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age [...] 'Health' refers to physical, mental and social well being"³. As Peter Laslett aptly showed, retirement is not anymore a time to rest in idleness but an active period of personal achievement and fulfilment, with paid work changing into volunteering⁴.

Although housing could include almost all roofed structures, this contribution is limited to man-made structures for daily living and nightly sleeping: dwellings, assisted living set ups and nursing homes, but not hospitals. Showing the importance of healthy and suitable housing for enabling active aging is the aim of this editorial.

Table 1. Average hours/day spent by older Americans
at some activities in 2010-2014 ²

Activity	Age, years			
Activity	55-64	65-74	75+	
Working	3.5	1.2	0.3	
Housekeeping	2.0	2.4	2.3	
Leisure & sports	5.3	6.8	7.5	
Sleeping	8.5	8.8	9.2	

HEALTH FOR ACTIVITIES

On a foundation of good physical health, mental and social health can flourish, enabling an easy accomplishment of normal daily tasks including work, volunteering, hobbies and the immensely important social contacts.

The human life course is divided in three phases: 1st, 2nd and 3rd age. By law in the Netherlands, it is a symmetrical set-up. 1st Age: 18 years to grow up (voting rights⁵). 2nd Age: half a century or more for paid work. 3rd Age: another 18 years of retirement with legal retirement age based on expected mean longevity⁶. In other countries the length of the three phases will differ, but the system as such describes the normal human life course, excluding catastrophes (war, flooding, earthquakes and other disasters; deadly inflictions or disease).

The 3rd age is divided into active retirement and a state of frailty⁴. A pleasantly active life, with a long 3rd age of active retirement, and morbidities compressed into a short but natural end period becomes our aim^{7,8}. Active aging aims at lengthening the active retirement phase and thus minimising the length of the frailty period.

Normal Activities of Daily Living (ADLs) may be grouped into three types: (i) Focussed on physical health (basic ADLs⁹), (ii) Mainly concerning mental health (instrumental ADLs¹⁰), and (iii) Supporting social activities and relations (social ADLs) (*Table 2*). Of these, the concept of social ADLs does not appear in the literature as yet, but social innovations are strongly supported by governmental policies in countries such as Finland¹¹, and have been known for a long time as one of the higher needs of people¹². Among US citizens without a partner and aged 65 years and over, the self-reported mean time of being alone at home amounted to 75% of 24-hours², stressing the need for social ADLs even more.

Active aging implies that ADLs can be performed with ease and pleasure. Nagamachi in this issue¹³

Group (abbreviation)	Characterizations
Basic ADLs	Daily self-care activities, such as feeding, toileting, transferring, toileting, dressing and bath-
(bADLs)	ing ⁹
Instrumental ADLs	Daily self-efficacy activities: using the telephone (currently also using smartphone and inter-
(iADLs)	net), shopping, food preparation, housekeeping, laundry, transportation, daily management of
	medication and finances ¹⁰
Social ADLs	Fulfilling daily social needs at the higher end of Maslow's hierarchy for deficiencies of
(sADLs)	needs ¹² : communication with close relatives, peers and other persons, visiting friends and rel-
	atives, receiving and entertaining guests, performing and enjoying work, volunteering, group
	sports, hobbies, sharing attitudes and beliefs towards religion, spirituality and politics

Table 2. Essential Activities of Daily Living (ADLs) of older adults at home

lists and shows a number of Kansei (human emotion) designed home interiors, services and furniture to support primarily basic ADLs but with enjoyment as added value, raising self-esteem of the older adult. Karol¹⁴ points at the omission in guidelines for housing design that forget the importance of the enjoyment part. Since all three types of ADLs are needed for active aging, healthy housing should preferably support all.

HOUSING AS A SYSTEM

Housing services form a system with a multitude of interrelations^{14,15}. These interrelations go beyond users and technology. An example: Dutch Building Regulations are striving towards sustainability and especially reduction of energy use in winter. To this end infiltration and ventilation of outdoor air in winter is reduced to below the level needed to keep indoor humidity in winter low enough to stop multiplication of allergen producing mites and fungi¹⁵. The resulting increased allergen exposure in summer leads to more (severe) allergic disease, such as asthma, rhinitis and atopic eczema. Currently, in countries like Ireland asthma prevalence in 6-9 year old schoolchildren is 20-25%¹⁶. After a lifetime of exposure to allergens and irritants, the badly functioning lungs are a burden to the heart and other organs in need of oxygen, and thus lengthen the frailty life phase with multiple chronic morbidities¹⁷.

Another example is Veteran's disease: an infection with *Legionella* bacteria while taking a shower, and with high mortality and common chronic morbidity at higher ages. Popular feelings against the environmental effects of disinfectants in potable water prevent its prevention in the Netherlands¹⁸.

For almost half a century, dust and dirt on floors, walls and ceilings have been recognized as an ecosystem where indoor humidity, finishing and furnishing materials and their interrelations are the major determinants for growth of mites, fungi and certain insects. This ecosystem can be effectively managed by ventilation and heating in Winter^{15,19,20}. It would be useful to expand the ecosystem approach to the whole housing system,

with all legal regulations, climatic aspects, construction, finishing and furnishing characteristics as abiotic factors, and pets, pests and behaviors of the user as the biotic part. With dedicated software the system could be simulated and show in virtual reality how measures taken to reach one societal goal, affects other societal aims.

Such an approach could help to choose and prioritize. "Do we consider active aging as our first priority or environmental protection?" And: "If active aging is the first priority, how far can we protect the environment without jeopardizing active aging?" The answers lay in the domain of politics, but research results of the housing (eco) system can legitimize the options.

For prevention

In the long run, life-long prevention of exposure to noxious influences has more effect on active aging of a population than support in old age for chronic debilitating conditions. Unfortunately prevention commonly has a low priority in health care²¹. However, the first building regulations in the Netherlands were considered hygienic legislature²². Today the preventive potential of built-in services of housing remains extensive. At least ten housing services are considered basic and preventive for disease to such an extent that they are taken for granted in industrialized countries. These concern shelter, safety and basic hygiene and are mostly related to basic ADLs (Table 3). The need for these services is the same in any country, irrespective of climate, culture or available technologies. However, as shown by Antczak & Zaidi²³, the need for suitable construction material, safe drinking water, efficient fuel used for cooking, and hygienic type and use of toilets is largely not fulfilled in China and India, where approximately one third of the world population lives²⁴!

This inspired Mihnovits & Nisos²⁵ to propose adding a new outcome section 'adequate housing' to the international active aging evaluation index GAWI (Global AgeWatch Index). This new outcome section should include the very basic and preventive housing services. Other proposed parameters to be included are accessibilTable 3. Public health engineering²¹: A selection of built-in preventive housing services with related health domains and Activities for Daily Living (ADL), placed in the order of actual implementation in housing; bADL=basic ADLs; iADL=instrumental ADLs; sADL=social ADLs; in bold: preventive housing services that are commonplace in industrialized countries

Housing service		Daily activities / health domain		
	Physical	Mental	Social	
Protection against rain, heat, cold, storm	bADL	-	-	
Providing safe drinking water	bADL	-	-	
Providing effective sewerage & waste disposal	bADL	-	-	
Flush toilet	bADL	-	-	
Accessibility of electricity	bADL	iADL	sADL	
Indoor climate control: ventilation, temperature	bADL	-	-	
Suitable lighting	bADL	-	-	
Noise protection	bADL	-	-	
Secure and comfortable layout of the dwelling	bADL	-	-	
Internet connectivity	bADL	iADL	sADL	
No barriers for mobility indoors	bADL	-	-	
General safety devices (burglary, fire, smoke, earthquake)	bADL	-	-	
Efficient, low-cost construction and finishing	bADL	iADL	-	
No barriers for entering or leaving dwelling	-	iADL	sADL	
Facility for receiving and entertaining guests	-	-	sADL	
Ample space for work and leisure activities	-	-	sADL	
Preventing entrance and development of noxious organisms in the dwelling	bADL	iADL	-	
Accident prediction and monitoring with alarm functions	bADL	iADL	-	
Facility for personal digital communication with family, friends, professionals	-	-	sADL	

ity and affordability of healthy and suitable housing^{25,26}. Adding 'adequate housing' as a section to evaluation indices could form a wake-up call for architects and construction companies and has to be recommended.

Going beyond the most basic housing services, also means that regional variation in needs arise. The housing service 'no barriers for leaving or entering dwelling' to prevent isolation (*Table 3*) may have different meanings in winter and summer. In for example Quebec (Canada) prevention of snow accumulations and slippery entrances in winter is essential²⁷. In hot climates the relevance of air-conditioning in preventing overheating²⁸ has the higher priority.

For support

Culture shows an even greater geographic diversity than climate and is especially important for the supportive functions of housing services. Hsu²⁹ pointed at Xiào (filial piety) as the driving force for supporting active aging in the Sinophone world that is hardly recognized in western communities.

A number of built-in housing services may directly support older adults in their active aging process (*Table 4*). This concerns compensation or substitution of waning physical power (built-in facilities for robotized housekeeping, lifting robot) or cognitive abilities (infrastructure for various memory supporting apps), and support for care or care management (alarms, transfer support). Some of these services, such as monitoring devices, are slowly entering the market as separate systems to be added to a completed dwelling, others, such as companion and talking robots and monitoring drones are still in the development phase^{30,31}.

Mollenkopf³² in this issue points at the societal aspects and individual preconditions for accepting these new technologies and stresses the need of a social-cultural view, including the symbolic meaning of technical artefacts. Supportive technologies are nowadays provided as separate health care products and are not seen as services that should have been built-in in the mainstream building stock. This currently implies special regulations for privacy and access, alienating the supportive services from the builders of dwellings. However, as Charness et al.³³ in this issue showed for older adults, privacy is not their main concern. Housing services for direct support of active aging could better be embedded in the construction domain, and be integrated in normal dwelling design and construction. It would make these services more normal, less stigmatizing, as well as less costly.

INTERNATIONAL COMPARISON

Current GAWI³⁴ ranks countries by how well their older populations are faring. It contains a section '4 Enabling environments', defined as "indicators of enabling features of communities in which older people live, prioritised by older people themselves" that contains social connections, physical safety outdoors, civic freedom and satisfaction with public transport. 'Social connections' could be related to housing services, such as internet connectivity and personal digital communication. Only 1% of the world population lives in the top-3 countries for enabling enviTable 4. Built-in housing services for compensation or substitution of retreating abilities or support of care in dwellings, assisted living facilities and nursing homes; ADL=Activities of Daily Living; bADL=basic ADLs; iADL=instrumental ADLs; sADL=social ADLs; *=robots and drones are still in the development phase^{30,31}

Housing service		Daily activities / health domain		
-		Physical	Mental	Social
Internet connectivity		bADL	iADL	sADL
ocation next to public transport bADL		iADL	sADL	
Storage space for personal mobility aid or means of transport		-	iADL	sADL
Smart toilet with warning function		bADL	-	-
Smart bathing and showering with alarm function		bADL	-	-
Kitchenware with remember support		-	iADL	-
Robotized housekeeping		-	iADL	-
Facility for smart washing machine		-	iADL	-
Accident prediction and monitoring with alarm functions		bADL	iADL	-
Facility for personal digital communication with family, friends, professionals		-	-	sADL
Infrastructure for telehealth, telecare and tele-monitoring		bADL	-	-
Transfer support		bADL	-	-
Docking station for	lifting robot*	bADL	-	-
	companion and talking robot*	bADL	-	-
	assistive robot*	-	iADL	-
	monitoring drone*	bADL	-	-

ronments (Switzerland, Austria and the UK). The lowest three countries (also 1% of world inhabitants) are Mozambique, Afghanistan and Malawi.

AAI (European Active Ageing Index) has a parameter '3.3 Independent living arrangements', defined as "Percentage of people aged 75 years and older who live in a single person household or who live as couple (2 adults with no dependent children)"⁷. Not surprisingly, of the 28 EU-countries the best quartile for this parameter contains the Nordic and Western European countries (together 50% of European Union inhabitants). The least enabling category (4th quartile) is mainly populated by Eastern and Southern nations³⁵ (25% EU population).

Neither GAWI nor AAI outcomes for active aging can currently be related directly to specific housing services. The services are not yet part of the definition, but adding the proposed 'adequate housing' indicator to these systems could complete the indices to show nations with the best practices under World (GAWI) or European (AAI) comparison.

CONCLUSION: HOUSING AND AGING

Housing services and aging are intimately connected, partly because older adults spend so much time at home, but also since housing can

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Healthy and suitable housing will allow ADLs to be performed with ease and pleasure (active aging), and stimulate physical, mental and social well-being. Existing active aging indices need the addition of a new outcome section 'adequate housing' to become a fairer measure of country comparisons and indicate best practices.

Effective healthy housing is complex. Only with an ecological approach can we understand healthy housing with all its abiotic (climate, location, culture, legally required dwelling details, etc.) and biotic (pets, pests, window plants, human users) elements. To be enabling for active aging, the interrelations between (and among) abiotic and biotic elements needs monitoring and steering in order to make people aware of required measures to reach active aging.

The author wishes the reader a pleasant and fruitful reading of this issue containing various elements of healthy and suitable housing for active aging.

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