Housing and Health in Later Life

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ABSTRACT

The goal of this paper is to compile recent data on the housing and health in old age, with special emphasis on geropsychological and gerontological studies. The authors first introduce their understanding of both housing and health. Second, theoretical models that are important to understand better the relation between housing- and health-related outcomes are incorporated into an analytic scheme. Third, data on objective and subjective aspects of housing in old age in relation to health-related outcomes are presented. Among the objective functional housing aspects are health-relevant micro-environmental indicators like housing hazards and amenities, retrofitting and assistive devices, as well as meso- and macro-environmental indicators like housing type, neighborhood conditions, or urban-rural differences. Relocation is a classic field in environmental gerontology in which drastic environmental change has been linked to health outcomes. Among subjective housing aspects are residential satisfaction, housing-related control beliefs, and meaning of home. Direct health-related outcomes, such as physical and mental diseases and functional limitations, as well as indirect health-related outcomes like satisfaction or well-being receive attention. We conclude with a discussion addressing the environment and health dynamics of aging in the future.

KEY WORDS

aging, person-environment fit, agency, meaning, well-being

INTRODUCTION

Many changes have occurred during the past few decades in demographic terms. Because of a major and persisting increase in life expectancy, individuals are getting older on a parallel track with that of society at large /1/. This development has come as a consequence of enhancements in health and functioning in the older population, driven by resources like better medical treatment and socioeconomic situation (for example /2–3/). Thus, many elders today—especially in Western societies—are relatively healthy (and partially wealthy) on the average. Life expectancy is further increasing in many countries, and most elders are able to remain autonomously in their familiar socio-physical settings until very old age.

Although the prevalence of disability among older adults has generally declined across the cohort flow of older adults during recent time, the absolute number of elders at risk of disability and health decline is increasing because of the pronounced increase of individuals beyond the age of 85 years, which represents the population with
the strongest growth dynamic in many societies (for example /2–6/). This aspect covers both physical as well as mental impairment, with dementia-related disorders being at the top of the ladder.

Also of substantial background importance for the current work is that the process of aging is no longer regarded as equivalent to decline. What has been coined the deficit view of aging has clearly been overcome, based on empirical research studies on aging that have emerged since the late 1980’s. In particular, a plethora of findings from the area of geropsychology, such as health and day-to-day functioning, supports the notion that aging can probably best be characterized by the simultaneous consideration of losses, maintained, or even newly created gain experiences /7–8/. For example, pronounced variability in cognitive functioning capacity persists until the tenth decade of the human life span, and related to this, about 50% of older people, a substantial subgroup, are able to live independently beyond the age of 90 years /9/. In most countries, the average percentage of those aged 65 years and older not living in the traditional home environment is far below 10%, and includes residing in especially designed environments like assistive living, and not only institutionalized housing (for example /6, 10–11/).

Nevertheless, clearly at the heart of aging lies a changing dynamic of experienced gains and losses, with the latter becoming more and more prevalent, whereas gain experiences decrease. This change is especially true with regard to health and functioning domains, which possess the most direct impact on person-environment transactions. In addition, the pronounced case of such an imbalance between gain and decline occurs specifically in reference to the term that has been coined as the “Fourth Age”—the period beyond 80 to 85 years of age /7, 12/. For example, the prevalence of a major threat of maintaining ‘normal’ housing in later life—namely, dementia-related disorders—increases from about 5% to 10% in the age period of 60 to 79 years to about 20% to 25% in the age period above 80 years /13/. Similarly, severe loss in vision affects about every fifth person in those 65 years and older, but affects every fourth person who reaches 75 years and beyond /14/.

Although a substantial relation has been found between age and decline in health and functioning, understanding its outcome in terms of a complex interplay of mutually influencing intra-personal and extra-personal factors is important. The major goal of this work is to review the evidence concerned with the role that housing can play as an extra-personal influence or—probably a more adequate view—as a major element of the ongoing person-environment transaction dynamics that is related to the outcomes of health, functioning, and well-being as people grow older /5/. Although this question has found some attention in recent review-oriented work on the ecology of aging (for example /15–17/), a focused synthesis of the health, housing, and aging empirical research has, to the best of our knowledge, not been undertaken. The opportunity to synthesize the knowledge base further is in accordance with the observation of an increasing attention given to health and housing during the 1990s by researchers both in and outside of the field of environmental psychology /18 (p.394)/.

When considering the specific relation between housing and health in old age, broad and diverse streams of vital research emerge. One area of research is related to classic work from environmental psychology. Many studies in this discipline emphasize the influence of environmental factors, such as crowding, noise, climate, and pollution, particularly on mental health /19–22/. Also postulated, but tentatively neglected however, is that given current demographic trends, much more attention is called for on mental health of the elderly in relation to housing and neighborhood characteristics as well /19 (p.495)/, see also /23/.

A second research stream is related to a classic health decline perspective emphasizing housing-related risks, especially those prevalent in old age due to increased frailty, like falls at home /24/.
Thirdly, one can consider classic environmental gerontology studies, especially those on involuntary environmental changes, such as forced relocation to a nursing facility, which can result in increased mortality rates, seriously compromised functional health, reduced life satisfaction, and the undermining of psychological well-being /25–26/; for an overview see /27/.

The selected examples suffice to demonstrate the generally existing complexity of housing and health relations /18/ that is explicated in the special situation of old age. Our goal with this paper is to organize and, by means of this organization, to reduce the complexity on different levels. For this purpose, we will start with our understanding of the broad concepts of housing and health applied to old age, which is crucial for addressing their interrelation. In a second step, and in complement to the aforementioned strategy, theoretical assumptions linking housing and health in old age will be introduced. This aspect will be channelled in a general analytic framework that will order the existing empirical literature.

In a third step, a synthesis of the major findings available in the empirical literature on housing, health and aging is presented by means of this framework. Our integration will consider, in a conceptually driven way, what we regard as key empirical studies in the field that represent the remaining work not explicitly cited in the review for reasons of clarity. Additionally, certain areas recently covered in other excellent review work will not be addressed in depth here. This approach applies specifically to the role of institutional aging and the impact of the institutional environment on supporting demented elders (see reviews by /28–30/). The work closes with a discussion that addresses the environment and the health dynamics of aging in the future.

The paper reports on findings of the literature based on a combined computerized and manual search strategy, including common virtual databases (for example, PsycInfo, Psycnet, GeroLit) and current journals and handbooks in the field of Environmental Psychology, Developmental Psychology, Gerontology, and Public Health. The focus, however, is on Journals from Gerontology (for example, Journal of Gerontology, The Gerontologist, Research on Aging) and Environmental Psychology (for example, Journal of Environmental Psychology, Environment and Behavior). From a first broad set of abstracts, most dating from 1990 until 2004, about 300 articles and books were selected for a further detailed full review if they appeared to cover the topic of housing and health, especially when emphasizing the relation between housing aspects (for example, conditions, needs, amenities, barriers, attachment, coping) and health-related aspects (for example, diseases, disabilities, activities of daily living, autonomy, well-being, depression) or when addressing later life and relevant topics in later life. During the review process about 150 current empirical articles in English, French, and German and another set of classical and seminal works were identified and selected for this paper.

TOWARD A COMPREHENSIVE UNDERSTANDING OF HOUSING AND HEALTH IN LATER LIFE

Because of the complexity of the issue, no gold standard or shared consensus has emerged for dealing with the nature of the link between housing and health. Thus, the need for different definitions and interpretations with regard to both omnibus constructs is obvious and depends on the specific circumstances of application—in our case old age. Nevertheless, following a broad understanding of ‘healthy residential environments’ /18/, ‘healthy housing’, or ‘adequate shelter’ /31 (p.3)/ seems wise for clarifying our understanding of housing and health in later life.
Housing in Later Life

Housing is not only the conjunction of the dwelling, the home, the immediate environment, and the community but also must be seen as a process of ongoing exchange between the individual and his/her objective and perceived immediate sociophysical setting /31/. Lawton /32 (p.106)/ has defined the objective living arrangement on the research level as all that lies outside of the skin of the participant, is animate, and may be specified by counting or by measuring in centimeters, grams or seconds, whereas the subjective environment covers personal meanings or functional significance for the individual. That said, the sociophysical environment of the home covers both objective, namely, observable and objectively measurable characteristics, as well as hard to observe perceived elements in need of in-depth exploration or other ways of approaching subjective world spheres /15/.

As a consequence of this understanding, the health implications of housing should not be restricted only to the ‘walls’ of the house or apartment but should also consider various meso- and macro-environmental levels in which the home is embedded like neighborhoods, community, or climate. Going further, health threats can be linked to objective risk factors inherent in the home environment or in potentially undermined subjective meaning in relation to housing as people age or both. Specifically important with respect to older adults is to look at both objective and subjective housing, not only as risks but also as health-protective factors able to help maintain competencies and well-being even in situations characterized by a dramatic loss of resources on the side of the aging person. This approach is true with many chronic somatic or psychic illnesses like dementia-related disorders.

Among objective health-related housing aspects, micro-environmental indicators—such as noise, lighting, heating, ventilation, fitting, and amenities—as well as meso-environmental indicators—such as type of housing, forms of assisted living, special care units, institutional settings, neighborhood conditions, and access to services and facilities—deserve consideration. In addition, the macro-level analysis of health in later life, such as urban-rural differences, is potentially important.

Furthermore, housing-related behavior and behavioral outcome related to the housing domain must be addressed in its relation to health. The scope of housing-related behavior in terms of the person-environment interaction covers agency in the exertion of everyday activities (for example, maintenance), accessibility and usability, environmental adaptation, retrofitting, and ecological transitions like voluntary or involuntary relocation /27, 33/. Housing adaptations, new forms of purpose-built homes, and in a sense, relocation, are also good examples to underline the preventive role of the home environment with regard to direct health outcomes, such as fall avoidance, increased accessibility, or keeping a maximum of autonomy in satisfying everyday needs and achieving the activities of daily living.

Compared with objective housing characteristics, subjective housing aspects are rarely discussed as being health-related. The emotional and behavioral adjustment of elders, however, not only draws from the objective forces of the environment but also is symbolic in nature and has to do with the experience of environment-related meaning and identity /34/. On an experiential level, subjective aspects of housing can be expected to be relevant for health outcome in terms of safety, privacy, and feelings of belongingness, especially in old age when individuals can refer to decades of biographical and physical ‘insideness’, namely, cognitive and emotional representation of the home serving to foster or hinder health-related outcomes, such as autonomy or well-being at large /35/.
Health in Later Life

Traditionally, health has been defined merely in medical terms, focusing on physical and mental body functions and structures. The classic World Health Organization (WHO) definition, however, dating from 1946, is much broader and has influenced the understanding of health since then and is considered to be a state of optimal physical, mental and social well-being and not merely the absence of disease and infirmity (WHO, 1946 quoted in /18 (p.35)/). The second edition of the WHO International Classification of Functioning and Disability (ICIDH-2) /36/ is especially helpful for an age-related understanding of health and disease because of its assumption of multi-faceted relations among health conditions, body functions, and structure, day-to-day activity, and participation; and the interfacing role of environmental and personal factors in all of these dynamics. Tentatively, in parallel with the WHO ICIDH-2 approach, health and disease in later life are understood in the widely acknowledged disablement process model as operating on the levels of impairment, functional limitation, and disability /37/. Although the model does not explicitly consider person-environment interaction, the disablement process is defined as a relational concept depending on the environmental context, and as such, is a promising tool for addressing home and health-related issues in later life.

- First, the health-related level of underlying pathology and impairment is regarded in terms of specific diseases, which can directly have an impact on autonomy in private housing arrangements in old age. Think of severe vision loss, arthritis, or hip fracture.
- Second, the model assumes a relation between what is coined an intrinsic functional limitation (for example, kneeling problems) and resulting consequences on the capacity to perform everyday tasks.

- On the third level of health and disease, disabilities of the person (for example, in terms of ability to perform the basic and more complex so-called activities of daily living (ADL) and instrumental activities of daily living (IADL), such as cooking), are explicitly regarded as the outcome of the interaction between the person’s capacity (resulting from impairment and functional limitation) and environmental conditions, in particular those related to the home environment (see also /38/).

Informed by the classic WHO health concept, as well as by what may be coined a modern understanding of health, health and disease outcomes related to aging must be seen as more than impairment or functional limitation and disability, which mainly address physical autonomy. Instead, health should also be understood in terms of various levels of well-being (for example, /39/), such as residential satisfaction, life satisfaction, purpose in life, or even identity and meaning of life at large. As with disability and autonomy, housing-related variables can also be assumed particularly crucial for well-being in old age. One line of argumentation can draw from Lawton’s /32, 40–41/ concept of the ‘good life’ in old age, considered as the evaluation of the p-e system in past, current and anticipated time /41 (p.6)/

THEORETICAL MODELS AND A BASIC FRAMEWORK FOR OUR EMPIRICAL SYNTHESIS

Housing as a Major Facet of Lifelong Contextual Development: Implications for Health

From a psychological lifespan perspective, development is closely related to the socio-physical context in every life phase /7/. Persons
always interact with their social and physical environment, leading to a meaningful representation of the self within the environment /42/. Within his *Ecology of Human Development*, Bronfenbrenner /43–44/ defines development primarily as the ongoing transaction between a person and his/her environment over time. Additionally, the transaction between the person and the social/physical environment becomes increasingly multifaceted from childhood through adult life and into old age because of the accumulation of layer upon layer of life experiences and place meanings /42/. Home places are especially important during certain phases of this lifelong dynamic, and housing is associated with ambiguous feelings throughout life. A child's home environment can be secure, supportive, and self-affirming, yet at the same time disruptive, frustrating, or frightening. This concept is especially true in later life: an elder's home might be a comforting, familiar place despite its becoming burdensome to maintain and unsafe and thus a source of anxiety /15/.

The major implications of a life-span model of development nurtured by the explicit consideration of the home environment for the relation of aging and health are as follows: First, the 'over-familiarization' connected to one's home environment in later life as a consequence of living at the same place for decades can lead to the under-estimation of potential health threats related to this context. To put it more concretely, elders often perceive their environmental conditions as unchangeable. Thus, older adults attribute the loss of health and functional capacity predominantly to themselves and their 'impairments' as compared to the environment in which they are living and aging and its 'barriers'. Furthermore, certain health consequences observable in old and very old age can be particularly strongly associated with the exposure to adverse home conditions, which is on average, much longer than in any other age group. In contrast, however, being accustomed to one's home for decades can also have an adaptive potential—for example, in terms of behavioral automatisms and routines, as well as better cognitive representation of the home, which is, for instance, particularly helpful when suffering from vision loss /45/.

**Objective Housing as a Major Shaping Force of Aging: Implications for Health**

From an environmental gerontology perspective, the relation of housing and health is closely linked to the ecological theory of aging (ETA) /46–49/, as well as to models of person-environment fit (p-e fit), as suggested by such scholars as Kahana /50/ and Carp /51/. Although long neglected in gerontological research, both families of models emphasize an objective environment and thus more functional links between the aging person and the environment on all levels of the micro-, meso-, and macro-system. The ETA basically describes the interaction between levels of competence (for example, functional limitations) on the one side, and settings with different levels of environmental press (for example, barriers at home) on the other side, leading person-environment interaction to zones of adaptation and comfort versus maladaptation and negative effects. One of the main assumptions in that regard is that the outcome of person-environment interaction is not exclusively predicted by either personal competences or environmental conditions but by the individual level of adaptation or p-e fit dynamics, respectively, to be addressed, for instance, in terms of accessibility /52–53/. The ETA and p-e fit theories both argue that the equilibrium between individual competence and environmental press is especially unstable in very old age, because adaptation capacities decrease in general as people age.

Physiological changes associated with aging and the growing risk of chronic illness tends to result in lifestyle changes as a consequence of reduced competence and increasing environmental vulnerability. The *environmental docility hypothesis*
46, 48, 54/ assumes that old age (besides early infancy) is a particularly strong case to expect pronounced vulnerability for environmental challenges and a growing share of environmental variation when it comes to the statistical explanation of outcomes like autonomy in daily life. Nevertheless, elders should by no means be reduced to adapt passively to environmental restrictions. Rather, elders are able to modify their environment actively, even when suffering from an environmental competence loss. This concept should especially apply to what is considered the 'new' generation of older people /55/. Reflecting this insight on the conceptual level, Lawton /56 (p.18–19) has introduced the notion of environmental proactivity as a counterpart concept to environmental docility:

The greater the competence of the person, the more likely the person’s needs and preferences will be successfully exercised to search the environment for resources to satisfy the needs... Examples of such transactional environmental resources are the cognitive map, the perceived or cognitively organized environment, the local amenities that are used, the state of maintenance of a home, the way it is furnished...and so on /56/.

Major implications of the ETA for the relation between aging and health are as follows: basically there is reason to assume that the relation between housing and health should be particularly strong in later life because of the increased vulnerability of older adults to environmental challenges. Given that outcomes in later life are substantially driven by variation in environmental contexts, a functional health outcome like autonomy in day-to-day living should be particularly triggered by objective housing hazards. Environmental proactivity, however, can also drive an aging individual toward improving the home environment as a means of prevention, which is likely to become even more so among future cohorts of elders.

**Subjective Housing as a Major Shaping Force of Aging: Implications for Health**

Especially in old age, housing is defined not only by functional links related to maintaining autonomy but also by meaningful links related to maintaining well-being and identity /15, 34, 57–58/. As Oswald and Wahl /57/ have argued, important in this respect are not only types of physical, behavioral, and social but also of cognitive and emotional bonding. To address some of these domains of bonding in more detail, Rowles and colleagues /58/ applied Relph’s /59/ concept of insideness to the home environment in old age. Based on in-depth interviews, Rowles suggests a three-fold concept of insideness of place as a core concept to understand what home means for older people /35, 60/.

- First, social insideness or immersion arises from everyday social exchange and social roles within a neighborhood over a long period, as housing and being in place involves sharing space with others, including social rules or daily social interactions.
- Second, physical insideness or intimacy is characterized by familiarities and routines of habituation within the setting itself that enable the individual to wear the setting like a glove /35 (p.114)/. Physical intimacy and familiarity with space through habitual use /58 (p.78)/ is probably one of the most important age-related aspects of being in place.
- A third aspect of insideness in old age is autobiographical insideness. This idea...stems from the temporal legacy of having lived one's life in the environment... Place becomes a landscape of memories, providing a sense of identity.../35 (p.114)/.
A recent conceptual framework was introduced by Wahl and Lang to further the decade-long separation of the social and physical environment based on what they have coined the *Socio-physical Places Over Time* (SPOT) model, covering both processes of functional agency and meaningful belonging in old age /61/. The major implications of subjective housing approaches for the relation between aging and health are as follows: First and most important is that addressing the housing and health dynamics in old age only in terms of objective housing characteristics means an unjustified reduction. Second, the consideration of various processes of subjective bonding, insideness and belonging as important facets of the person-environment system in later life adds to a wider understanding of housing and of health outcome. In particular, a loss in well-being, meaning of life or identity at large can be driven by such subjective home-related processes.

Stress Models of Aging, Housing, and Health

Both the ETA, relying predominantly on the objective housing context, and the subjective housing approach, relying predominantly on meaning and bonding processes, were in their basic intention designed more to address ‘normal aging’ and to highlight the role of the home environment in this process. Although their intention was not so much to explain health or disease, we would argue that these models provide the basic architecture to consider the link between housing and health outcomes. Additional theoretical input, however, is needed to channel the potential of these models toward the explanation of health outcomes. One helpful conceptual pathway for this approach is the stress-theoretical model applied to the ecology of aging.

Informed by what has been said in this regard by scholars such as Saap /62/ and Schooler /63/, the experience of environmental stress is likely to occur if experiences like major housing hazards, ongoing noise or unsafe microclimate, persistent feelings of insecurity, or anticipation of detrimental developments in the housing and neighborhood domain are perceived as uncontrollable or no longer controllable threat situations. In addition, the likelihood of experiencing loss of control regarding such stress is especially high in old age because certain coping options, such as moving out or going for a fundamental rebuilding of one’s home, tend to become even more stress-provoking in the imagination than the real life stress related to the actual housing. Thus, we can safely assume that the situation of experiencing stress in the home-environment—in conjunction with the experience that the most crucial coping possibilities to deal with this are quite stressful as well is not least the typical for older people—represents a major pathway toward decline in health. In contrast, theories of environmental restoration and coping have not yet been addressed to the process of aging, which could, however, be a further step to broaden the perspective in this regard (for example /64–65/).

Public Health Understanding of Aging, Housing and Health and the Importance to Differentiate between Direct and Indirect Health Outcomes

In addition to the conceptual models introduced above and to foster a better understanding of the link between housing and health in old age, we feel that further differentiation is needed on the level of health outcomes and their relation to antecedent conditions on the level of housing or—probably a better view—on the level of person-environment interactions.

Shaw /66/ recently presented a model on the relation of housing and health from a public health perspective that also seems to be a promising organizing tool when applied to the specific situation of old age. Also important, Shaw’s /66/ approach is consistent with what already has been suggested on the conceptual level, particularly in terms of functional vs. meaning-related links between
aging, housing, and health. Concerning housing, Shaw /66/ contrasts the hard/physical/material aspects of housing from the soft/social/meaningful aspects of housing. Concerning housing and health interactions, Shaw distinguishes direct interactions, mostly located in the individual/household level from indirect interactions exclusively on the area/neighborhood level.

Among the direct housing and health interactions for hard/physical/material environmental aspects are physical effects of housing on health in terms of damp, cold, mold, heat, and homelessness. On the level of the soft/social/meaningful environment effects of poor housing, insecurity and effect on mental health are mentioned, as well as feelings of home, social status, and ontological security. As an example of indirect housing and health interactions for hard/physical/material environmental aspects, the model covers indicators like income, wealth, proximity to services and facilities, features of the natural and built environment. On the level of soft/social/meaningful environment area, culture and community, as well as social fragmentation are mentioned.

**Toward an Analytic Scheme Helpful to Organizing the Empirical Literature**

Having described those conceptual approaches that we regard as most helpful to understand better the housing-health relation in later life, it is important to note that this set of models should be seen as complementary. Our view is that the complexity inherent in housing and health relations cannot be covered by only one conceptual line of arguments (see /18/). This general insight also applies for the aging individual.

That said, the next challenge is how this insight can be channeled to help organizing the empirical literature. For this purpose, we have developed an analytic scheme that is mainly driven by the basic ideas of the conceptual models summarized in the subsequent sections; in particular, what has been said in terms of functional links vs. meaningful links (for example /32, 35/) and direct vs. indirect health outcomes /66/ is used to build this scheme, as shown in Fig. 1.

The logic of the scheme is a cross-tabulation resulting in four cells that can be used for categorizing the empirical housing and health literature concerned with old age. On the level of housing, we distinguish between the functionality and the meaningfulness of the home. Functional characteristics cover observable hard, physical, material, and behavioral aspects of housing on the micro-, meso-, and macro-level of the environment, addressing specifically p-e processes of agency and accessibility, based on theories of environmental docility and proactivity or p-e fit, or functions of support and stimulation, respectively.

Meaningful characteristics cover more hidden or unobservable soft, social, and individually meaningful and belonging-related aspects of housing on the micro-, meso-, and macro-level of the environment, addressing specifically the p-e processes of belongingness, place attachment, and insideness (see also /63, 67/). To avoid complexity within this scheme and informed by the basic understanding of environmental psychology and gerontology, we mainly focus on the physical aspects of housing and defer the social aspects of co-dwelling, family support, social exchange with friends, visits, and others. Nevertheless, at the same time we want to stress that social aspects are important and often addressed in the reported studies, although not specifically addressed within the scheme.

On the level of health, we distinguish between direct and indirect outcomes of housing-related aspects, in accordance with Shaw /66/. Direct health indicators cover not only impairments and functional limitations on the physical and mental level of health but also injuries or accidents, like falls at home. Furthermore, direct health includes disabilities and behavioral autonomy in activities of daily living or security and safety at home.
Level II: Health in Later Life

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<th>Level I: Housing in Later Life</th>
<th>Direct Health Outcomes</th>
<th>Indirect Health Outcomes</th>
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<td></td>
<td>Physical and mental disease, impairment, functional limitation disability, injury, accident, autonomy in ADL-IADL.</td>
<td>Cognitive and emotional aspects of well-being, e.g., satisfaction, affect, depression, identity in terms of maintaining the aged self from a biographical perspective</td>
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**Functionality of Housing**

- Hard, physical, material, behavioral aspects, addressing processes of agency, e.g., docility or proactivity
- Micro: temperature, mould, amenities, barriers, fitting, use, adaptation, creation, modifications etc.
- Meso/macro: type of dwelling, tenure, purpose-built homes, neighborhood, urban-rural etc.

- Traditional risk factor/prevention perspective on person-environment relations
- Emphasizing direct and indirect health outcomes
- Mainly based on quantitative methods
- Mainly definitive/strong empirical evidence

**Meaningfulness of Housing**

- Soft, social, meaningful aspects, addressing processes of belongingness, place attachment and insideness
- Personal meaning: physical, behavioral, cognitive, emotional, and social aspects, e.g., familiarity, privacy, reflection, remembering, planning, perceived control, satisfaction, social exchange etc.

- Expanded experiential perspective on person-environment relations
- Emphasizing indirect health outcomes
- Mainly based on qualitative methods
- Mainly possible/weak empirical evidence

Fig. 1: A analytic scheme addressing the relation of housing and health aspects in later life
Indirect health indicators address health from a broader perspective of well-being and identity in later life. Well-being covers cognitive aspects like residential satisfaction or life satisfaction, as well as emotional aspects like positive or negative affect or depression. Going further, identity indicates health in terms of a global construct of maintaining the aged self as it was from a biographical perspective.

Cross-tabulation of both dichotomies on the level of housing as well as health results in the following: Combining the functional aspects of the home with direct and indirect health outcomes represents most clearly the traditional view of risk factor thinking and respective health outcomes. A diversity of mostly objective hazards related to housing in its broadest understanding is linked via different mechanisms to direct and indirect health consequences.

Our hypothesis is that most of the existing empirical work belongs to this category, and that a body of evidence supports this view. Combining the aspects of the meaningfulness of housing with direct and indirect health outcomes brings in a tentatively new perspective in which we assume that personal threats associated with housing-related meaning can also harm older people in terms of direct or indirect health consequences. Here, our hypothesis is that this perspective has not yet found much attention in the literature and that it remains to be seen whether the existing empirical evidence supports this category of our analytic scheme.

An important distinction, particularly relevant for linking housing and health in later life, finally deserves mentioning, namely, the differentiation between person-environmental risk constellations and prevention. On the one hand, physical hazards or relocation to take two examples, represent major risk factors with the potential to result in direct or indirect health decline. On the other hand, a barrier-free environment or the retrofitting of existing home environments now widely used in the service field or the relocation of a demented person to a well-designed special care unit may have considerable preventive effects and may add to the maintenance of autonomy and well-being over time.

Because of the complexity of looking at environmental features in terms of risks or as a preventive means (When does risk end and when does prevention begin?), we have not explicitly considered this distinction in our analytic scheme in detail. Nevertheless, whereas the traditional risk-factor and prevention perspective is more related to the level of functionality of housing, the level of meaningful housing is more related to an extended experiential perspective on housing in old age and thus offers an expanded perspective on prevention in terms of ‘existential’ risk or protective factors as people age. The tension between risk and prevention should be kept in mind when it comes to various empirical results related to the cells of the suggested analytic scheme.

**EMPIRICAL DATA ON AGING, HOUSING AND HEALTH: A CONCEPTUALLY DRIVEN SYNTHESIS**

We start the empirical review part of the paper with an outline of data able to emphasize the priority of housing as people age. This approach will then provide the empirical background to considering the empirical data regarding housing and health. We will follow the basic structure as suggested in Fig. 1.

**Empirical Background for Considering Housing and Health-Related Outcomes: Housing is a Priority Area in Old Age**

Although the likelihood of living in a nursing facility increases with age and the number of alternative purpose-built homes is also increasing in modern Western societies (for example /68--
elsers have a high degree of residential stability, and most wish to live independently for as long as possible. An increasing proportion of elders in most Western societies are living alone, often in urban regions, and this propensity increases with age, especially for women and in very old age /70/. Considering the dynamics of an elder’s everyday life, evidence supports a progressive reduction of the spatial range of activities, especially in very old age /71–72/. As a result, elders tend to spend substantially more time at home than do younger people. To take the example of Germany: recent data show that elders (65 years of age and older) spend on average 80% of a day course at home /73/. About 80% of elders’ daily activities take place at home and nearly half of these include leisure activities /74–75/. Thus, interior space is key living space in old age—both in terms of time spent at home and the creation of place as a setting for activities /15/.

Additionally, contemporary architects and design professionals are becoming increasingly sensitive to the special housing needs of elders, including the need to provide and improve accessibility at home and to outdoor spaces /76–77/. This approach is likely to become increasingly important for the rapidly growing population of community dwelling elders in their ‘Fourth Age’.

Functionality of Housing/Direct and Indirect Health Outcomes

The role of amenities and housing hazards. In Western societies, most elders live in homes that are equipped with basic facilities. For instance, in the United States (U.S.), complete plumbing facilities (hot piped water, bathtub or shower, flush toilet) are available in 97% of residential units /6/. Similarly, in Germany the percentage of persons over 65 years of age who live in modern apartments (with hot piped water, bathtub or shower, flush toilet, central heating) is 94% in the western and 85% in the eastern part of the country /78/. Yet, older adults, more often than young adults, have a tendency to live in older and often less well-equipped residences as a mere consequence of lengthy residence. This aspect was shown, for instance, in a recent WHO study including 8519 persons of which 15.4% (1314) were 65 years and older, reflecting especially low housing quality among elders, for example, due to outdated heating facilities and so on /79/. Poor quality of home has been shown to be a major cause of physical illness and poor health in general (for example /18, 31/), and in old age in particular (see for an overview /16, 33, 79–83/).

To exemplify the broad range of environmental characteristics discussed as housing hazards for occupants of different age, mainly on the microlevel of housing, data from the recent update of the statistical evidence behind the Housing Health and Safety Rating Scale (HHRS) report is briefly addressed. This report summarizes data on housing hazards and their impact on health outcomes in the United Kingdom (U.K.) /84/. Listing 22 different housing hazards and related risk groups, the following 9 are important risk factors for older adults in particular:

1. falls on floors (see below in detail),
2. inadequate lighting,
3. fire hazards (especially very old elders 80+),
4. entry to the home by intruders,
5. hazards from excess cold and heat (especially elders with low income, see also below),
6. hazards associated with noise (especially related to psychophysiological effects and sleep disturbance, see also below),
7. hazards associated with inadequate provision of food safety (leading to hospital admission and death), and
8. hazards from contaminated water (leading to infections of various kinds).
Another group of housing hazards is related to several age groups at risk, elders being one of them. These hazards include the following:
1. entrapment and collision, with older adults being especially at risk for lift accidents;
2. accidents with uncombusted gas fuel, posing a risk for elders with respiratory problems;
3. hazards from carbon monoxide for elders with a history of heart and lung disease; and
4. hazards from excess heat, again with high risks for elders with cardiovascular disease.

Worth mentioning is that another group of home hazards does not explicitly address elders (but often young children and pregnant mothers) as the most vulnerable group. Among them are, for instance, electrical hazards, poor ergonomics, hazards from damp, mold, growth, or hazards associated with domestic hygiene, and pests /84/.

Research addressing the role of noise exposure as a housing-related hazard has so far produced rather inconsistent results. Some studies assume that daily traffic air pollution and noise are a greater burden to those 45 years and older (for example /85/), whereas others have not found strong empirical evidence in this regard /86/. Convincing evidence of noise exposure on sleep disturbance has shown, on a substantial empirical ground, that noise during sleeping periods is leading to higher rates of sleep disturbance among elders than among younger adults /87/.

The link between specific housing-related hazards and old age is often moderated by other aspects, especially prevalent in old age, such as living alone, being frail, or having little access to the outdoor environment. To exemplify this complex pattern of predictors, we want to focus on the role of temperature and heat in old age. Based on a large European WHO study on housing and health (LAfRES) /79/, several basic health-related environmental risks have been analyzed, such as air quality (for example, through exposure to tobacco smoke either directly or second hand, emission of pollutants and subsequent respiratory infections, or asbestos-caused fibrosis and lung cancer), mold growth inside damp buildings, hygrothermal conditions (for example, humidity and temperature), or noise exposure /31, 79/. Particularly, as far as temperature is concerned, researchers found that for many countries around the world, a minimum of cardiovascular mortality (which is most important in old age!) occurs at a daily mean temperature of about 20 °C, increasing as the temperature rises or drops. Recent findings from the U.K. suggest that indoor temperature and factors associated with poor thermal efficiency of dwellings, including property age, are clearly linked to increased vulnerability to winter death from diseases of the heart and circulation /88 (p.2)/. The authors found a 23% excess death rate for heart attacks and strokes in winter months compared with other months of the year and a significantly higher seasonal excess of mortality in cold dwellings. Although the authors state that no clear socioeconomic gradient in risks of excess winter deaths was found, additional analyses from the LAfRES study, for instance, revealed that elders in particular more often report financial problems in obtaining the appropriate heating in their homes /79/.

Thermal stress covers housing hazards that are widely related to environmental safety and security /89/. The tremendous impact of low /90/ and high outdoor temperature on mortality in old age /91/ was empirically investigated after the record-setting heat wave in July 1995 in Chicago, where at least 700 excess deaths were reported within a 3-day period, most of them older adults /92/. As was shown, among individuals at greatest risk of dying from heat were elderly persons and those with medical illnesses who were socially isolated without access to air conditioning. Multivariate analyses revealed an increased risk especially for those who lived alone (odds ratio (OR) = 2.3) and those who were confined to bed (OR = 8.2), whereas having social contacts or friends in the
area was protective /92/.

Comparably, a study on the heat wave in France in August 2003 revealed a tremendously increased risk among those 75 years and older, showing that 81% of the excess deaths were of that age. About two-thirds of those who died from hyperthermia were living in nursing homes, reflecting the risk of being confined to bed as well as the limitations of even so-called sheltered environments for older people set into extreme person-environment constellations /93/.

In attempts to deal with housing hazards, increasing emphasis has been placed on the design of interior residential environments fostering health and safety, especially to reduce the risk of accidents and falls inside the home /89, 94–96/. Physical hazards related to health in particular (step design, flooring materials, lighting and others) are of major concern for less secure housing and thus for well-being in old age /97/. Falls, however, are a good example to demonstrate that two factors are always in complex transaction in home accidents, namely, the design of the dwelling and the behavior of the occupant /31/. The behavior of elders can cause accidents, for example, reduced mobility; older occupiers can create hazards for falls by leaving obstacles on stairs, having loose carpets, and so on.

In Germany, as an example for a society with a relatively high housing standard, elders (65+) report about 550,000 accidents at home per year. About 9000 of the accidents lead to loss of autonomy, and another 9000 accidents result in death /98/. According to recent international data, about half of community-dwelling elders 80 years and older fall each year /24, 99/, of which about 20% fall more than once per year. Among the consequences of falls are severe injuries (30%), contact with a physician (10%), and fracture (2% to 4%) /24, 99/. For the U.K., about two-thirds of deaths and very serious injuries from falls on stairs or steps in the home occur in victims 65 years old and over /84/.

With regard to cognitive impairment, such as dementia, we must consider that most elders with dementia (60% to 80%) are living at home, either alone or with family /5/. As this number will increase tremendously during the next two decades, the home environment is a key area of investigation aimed at supporting elders with dementia, for example, in terms of combined intervention strategies (see later in this chapter) and environmental adaptations /100–101/. Among such adaptations are particular means to optimize orientation and mobility, as well as to guarantee safety and security at home—for example /101/. The adaptations shall serve to provide necessary amenities on one floor and with open doors to

- give simultaneous visual orientation to minimize complexity of "unclear" objects,
- give large orientation cues whenever possible, to allow for wandering,
- maximize the amount of daylight and the access to the outdoor visual field through windows, as well as
- hide physical outdoor access to avoid unnecessary stimulation for outdoor activities.

The role of retrofitting, assistive devices, and naturally occurring compensations. Also related to the micro-level of housing, recent decades have witnessed an increasing propensity for retrofitting housing with environmental aids and other forms of home modification and adaptation /33, 69, 76, 81, 102/. Although systematic analysis of home modification for older adults has produced somewhat mixed results, enhancing the ability to perform ADLs and IADLs /33/, evidence of a positive outcome with respect to maintaining daily activities has been reported /103/. Significant improvements in bathroom equipment have proved to add to autonomy in self-care and in whole-body washing /104/. A study with demented elders has revealed that interventions involving combinations of environmental adaptation and training enable some elders who are not living alone to remain at
home /100/. Dwelling modifications can bridge deficits in everyday functioning and reduce the costs of care and the burden of (family) caregivers, thereby increasing the life quality of the person /105–106/. Besides, the emergence of a universal design and the growing recognition of the value of smart home technologies substantially increases the potential for elders to remain in and function effectively in their home settings /107–109/. Newman's /106/ study within a group of 60,000 elders of the American Housing Survey revealed that the number of housing-related difficulties is the strongest predictor for difficulty in functioning in the dwelling and for the need of assistance. Many elders, however, seem to be unaware of the usefulness and health-maintaining effects of environmental modifications and retrofitting /110/.

Recently, Giltin /5/ reviewed the empirical evidence on the health-related supportive functions of home modifications and assistive devices in old age. Frail older adults with low income are at the greatest risk of having unmet housing modification needs. The American Association of Retired Persons (AARP) study Fixing to Stay included 2000 persons 45 years of age and older and showed that many Americans modify their homes and make simple changes to make them easier to live in /103/. The National American Housing Survey showed that 14% of elders had disabilities that affect everyday life at home; 49% had at least one home modification, and the homes of 23% were in need of modification /106/.

Additionally, the European WHO study on housing and health revealed that elders particularly reported higher portions of required housing adaptations than did other age groups /79/. As an unexpected finding, those living alone and those with lower incomes are more—not less—likely to have one or more modifications /106/, reflecting that financial resources are not the only predictor for home modification. Furthermore, broad empirical evidence based on large national data sets supports the notion that a general decline in reliance on personal assistance among impaired elders at home is related to improvement in the use of home modifications and assistive devices like canes, ramps, grab bars, and stair lifts /5, 103, 111/. Nevertheless, differentiated analyses reveal that a positive effect further depends on the levels of impairment and the type of assistive device /5, 104/.

The role of behavioral strategies. Several reports have shown that based on the environmental docility hypothesis and the ETA /46–48, 112/, as well as the congruence model of person-environment fit /50/, elders with a higher range of behavioral performance show more adaptive and compensatory strategies (namely, compensation of disabilities such as in-home or community mobility) and use more assistive devices than do very frail elders who perform close to their maximum capacity in everyday life (for example, /5, 113–114/). For instance, this approach was found for elders with different types of sensory and functional impairments. Wahl and colleagues /115–116/ reported a strong correlation between reduced environmental competence, such as vision loss or mobility impairment, and objective living arrangements. In all groups of impaired elders, those individuals who performed a better p-e fit at home revealed subsequently higher levels of ADL independence. Certain environmental strategies can also safeguard the person against falls or other health-related outcomes, such as depressive symptoms associated with increasing functional limitation /5/.

The role of housing-related control. Moving beyond everyday behavior, assistive devices and environmental modifications to maintain or to enhance barrier-free access to housing facilities, evidence of special types of behavioral adaptation among elders in the use of their homes has been reported. Observational data have shown a recurring tendency for environmental centralization, especially around the most favored places at home. The adaptive potential of centralization lies in
maintaining and enhancing competence in the immediate environment, thus, through a process of miniaturization, establishing ‘control centers’ or ‘living centers’ /57, 117–118/ that eventually affect health and well-being. Beyond the adaptive potential of centralization, however, ‘living center’ serves to concentrate personally important symbols /118/. Both processes are related to housing-related control in later life /119/.

The role of housing type. Addressing mainly the meso-level of housing in more than 50 different studies, Evans and colleagues /19/ revealed the impact of housing quality and housing type on mental health. Regarding high levels of housing quality, several direct positive effects on well-being were reported, although the explicit consideration of older adults remained rare in these studies. As found before, unimproved housing is related to higher levels of depression in old age /120/. In another study, Evans and colleagues /80/ found that housing quality is associated with a positive effect among older adults living in their community independently. Based on a qualitative data analysis, a recent study revealed that housing tenure (in this case being owner-occupier) generally contributes positively to indirect health outcomes such as well-being, whereas the opposite effect occurred for people whose resilience was low or whose health was declining (for example, in old age) /121/.

During recent decades, the variability of housing arrangements for elders has increased, addressing not only housing needs and modifications—for instance on the level of retrofitting at home—but also special forms of assisted living and naturally occurring retirement communities (NORCs). Today, an array of different kinds of purpose-built dwellings exists, often providing supportive services and characterized by the umbrella term ‘assisted living’. Continuing care retirement communities (CCRCs), independent and assisted-living facilities (in the U.S.), co-housing and assisted housing (in Europe), and an increasing number of facilities especially designed for demented elders are now important options within the housing landscape. In addition, this landscape now encompasses naturally occurring retirement communities (NORCs) that result from increasing concentrations of elders left behind as younger families move out of an area. From a broader social capital perspective, a clear evidence-based link has been identified between novel forms of senior housing and indirect health outcomes /122/.

Reviewing a small number of studies regarding the relation of housing types and mental health, Evans and colleagues /19/ found that multiple dwellings versus single, detached family dwellings and high-rise versus low-rise buildings have an adverse impact on psychological health, but again, only very few studies included older adults. Vaillant and Furac /123/ showed that housing type and subsequent social contact are predictors for mental health in older people. Comparing elders, the effect of detached housing units, multi-units, and institutions on a set of mental health indicators, these scholars found specifically that depression was highest in institutions versus multi-units versus detached units (especially for men), while simultaneously controlling for other variables. Anxiety, however, was not linked to housing type but rather to gender (women more than men), whereas self-esteem was linked neither to housing type nor to personal indicators in multivariate data exploitation.

The role of neighborhood and access to outdoor amenities. Next, addressing mainly the macro-level of the home environment, relating neighborhood characteristics, such as safety issues, minority problems, or transportation, to health as people age has received considerable attention during recent years /89/ (for a comprehensive review see /124/). An AARP project was conducted as a national search to identify effective programs in neighborhood-crime prevention for elders involving
educational programs, police foot patrols, and elder volunteers. Outdoor amenities and services, especially access to basic social and medical services, must be considered crucial indicators for health in old age (for example /106/). Important in this context is considering that basically, today's elders are far from being home-bound. As was recently shown in a European study on outdoor mobility in old age (MOBILATE), most elders in this sample have good access to fundamental services (within 15 minutes reach), such as food store, doctor, pharmacy, bank, post office, bus or tram stop; this situation differs, however, from neighborhood to neighborhood across several European research sites. Several studies demonstrated that, for instance, socio-recreational aids and community accessibility predict health and depression complaints as well as satisfaction among elders (for example /127/).

The role of rural aging. Although most of the older adults in western societies live in urban areas, the impact of community access and the role of the immediate outdoor environment on health is especially important in geographically remote areas, to further exemplify the role of the macro-context of housing. Research on rural aging has consistently revealed a clear link between infrastructural disadvantages in rural settings and health-related outcomes. All in all growing old in a rural area combines challenges of later life with living in a sparsely populated and geographically remote area, creating a double jeopardy for the older rural adult. Beside supportive infrastructures and accessibility, other health-related outcomes, such as subjective well-being, are central to rural aging research.

The role of relocation. The link between housing and health in old age on all levels from the micro- to the macro-system of the home is nowhere more apparent than in the plethora of studies on the relation between relocation and both morbidity and mortality. Thus, we will further describe this topic in detail. In general, the transition in the living arrangements of older adults is a relatively rare event in Western societies. Although the number of relocations is not always clearly documented, in any recent five-year period, people of retirement age are only about half as likely to make long-distance moves as is the U.S. population as a whole (p.45).

Data from European countries also indicate low relocation rates for older age groups in general (for example /139/). Whereas long-planned decisions to move from one home to another are often made by relatively healthy and affluent elders, the sudden and unexpected loss of home tends to occur more frequently among very old frail individuals. From a health-related perspective, both positive and negative consequences of relocation should be addressed. Relocation is considered a stressful experience at any period in the life course, but the positive aspects of a change of residence have been emphasized with respect to health outcome.

To describe positive and negative outcomes of relocation from home to home, one might ask whether the subsequent environmental conditions have changed for better or for worse. Thus, when the moves are voluntary, elders who are able to exercise choice do not necessarily report negative outcomes of changes in their home environment. Rutman and Freedman reported increases in environmental satisfaction following relocation. Based on a register of 22,579 older persons, Danermark and colleagues analyzed the effects of residential relocation among elders. Their data could not support any substantial link between residential relocation among elderly people and mortality or the consumption of health services. We should note, however, that for the subgroup of elders who moved permanently and, presumably, reluctantly because of urban renewal, the mortality rate was higher than among non-movers and those who moved for other reasons.
Involuntary environmental changes, such as forced relocation to a nursing facility, can result in an increased mortality rate, seriously compromised functional health, reduced life satisfaction, and the undermining of the psychological well-being of elders. This outcome seems to be especially true if they are already vulnerable in terms of declining health or financial status /25–26/. Early studies on relocation to institutions were quick in using terms such as ‘relocation trauma’ or ‘transfer trauma’, that is, in assuming that harm can occur when an older person is moved.

Indeed, a series of studies conducted in the 1960s and 1970s documented significantly increased mortality rates resulting from relocation /145–146/. In Bourestom and Tars’ study /145/, in a ‘radical environmental change’ group, almost twice as many persons died in the year after the relocation in comparison with a matched control group that did not relocate. Those who did not die from the relocation frequently became depressed and disoriented and reduced their level of activity /145/. Psychological deterioration and serious physical illness were also more pronounced following relocation /147/. On the other hand, in a more recent study of 269 elders moving into a new nursing home, no increase in mortality was found /148/. An increase in mortality did occur, however, during the 1-year preparation phase before relocation. The authors argue that this outcome might have resulted from unintentionally creating great stress among those to be moved during the anticipatory period before the actual move—see also /149–150/.

A decline in health status among persons after relocation can be attributed to a combination of effects, including the characteristics of the person, the nature of the transfer, and the environment itself (for example /149/). Among the personal effects, those who moved were selectively more ill than those who did not relocate. Controlling for health status before the move, mortality and morbidity rates increased after an unexpected relocation into institutions. The characteristics of a new environment (for example, lack of amenities, limited recreation facilities, high population density, and lack of personal space) can have a negative impact on the individual, leading to a decrease of health status /145, 151–152/. Finally, the ‘social dislocation’ of relocation to an institutional setting is disorienting for a frail older person and in itself can cause a ‘cultural shock’, leading to a negative outcome /153/.

Although the consequences of relocating elders with dementia are not documented easily, recent data show a negative outcome. Using data on 272 persons with Alzheimer disease who were admitted to a nursing facility, Aneshensel and colleagues /154 (p.S152)/ found empirical support that relocation is associated with a two-fold increase in the mortality risk of health status. In addition, the authors observed selection effects for post-admission mortality from poor health, advanced age, being male, and being white. No specific indicator of stressful admission or unsatisfactory nursing home conditions was significantly related to mortality, however.

Results are somewhat mixed on the outcomes of relocating persons with dementia into special care units /28, 155/. Some elders suffer from high rates of depression and mortality following relocation. On the other hand, moving from a non-supportive setting to a new and more pleasant environment can reduce negative impacts for some residents (for example /156/). Increasing knowledge and expertise with respect to the design of specialized units for persons with dementia /28/ will likely lead to improved outcomes and an enhancement of the resident’s well-being. Finally, we should say that studies in this area of inquiry have always been criticized for their methodological flaws, including selectivity problems, and lack of adequate comparison groups /157/. Such studies should thus be interpreted with great caution.
Meaningfulness of Housing and Direct/Indirect Health Outcomes

On the link between objective and subjective housing in old age. Studies of the person-environment relation have typically focused on ‘external’ and easily monitored dimensions, such as amenities, purpose-built housing types, accessibility, and infrastructure, or the availability of resources and barriers to mobility. But—as we have argued before—such research emphasizing environmental accessibility and the reduction of risk, through the creation of physically enabling environments, sometimes neglects the equally important hidden dimensions of ‘internal’ psychologically based ties between person and place, such as place attachment, the meaning of home, or perceived housing usability, that enhance the health, well-being, and quality of life at large /10, 15, 83/. For example, the most comfortable and favored places in the home not only can allow for the manipulation of necessary and preferred items close at hand but also can be selected to afford a good view out of the window—thus creating a surveillance zone facilitating vicarious participation in the world outside as well /158/.

Being restricted on the level of behavior because of sensory impairment might be outbalanced by high levels of cognitive and emotional bonding to the home environment as a safe and familiar, but also beloved, place /57, 115/. Although most often either objective or subjective aspects of housing have been addressed, most recently, studies on the link of objective and subjective home and its explicit impact on the aspects of healthy aging, such as autonomy, participation, and well-being, for example, for independent living elders in their very old age, have been implemented. The first results from the most recent European project on the impact of functional and meaningful housing in very old age on healthy aging among 1918 elders from 75 to 89 years of age (ENABLE-AGE) demonstrate a consistent link between objective (for example, accessibility) and subjective (for example, meaning) housing aspects and direct and indirect health outcomes like autonomy and well-being /159–162/.

To address objective housing conditions and housing accessibility /83/, the research team applied a measurement instrument developed within an occupational therapy background—the so-called Housing Enabler /53/. To consider the meaningfulness of housing, other measures like the Meaning of Home questionnaire /159/ and the Usability in My Home questionnaire /160–161/ were used as well. As found, the objective housing accessibility and the subjective dimensions of housing are strongly related to both direct and indirect measures of health, supporting a contextual understanding of health in old age and reflecting the complexity of links among the various dimensions /162–163/.

As another example of the link between functional and meaningful aspects of housing in relation to health in old age, Evans and colleagues /164/ found in the Pathways to Life Quality Study on the effect of housing quality on psychological well-being, that place attachment is an important mediating variable. Elderly residents of high-quality homes, independent of multiple socio-demographic factors (for example, income, gender), felt more attached to their homes, which in turn, accounted for the relation between housing quality and positive affect /80/.

The role of residential satisfaction. Residential satisfaction is a reflection of and an important construct in assessing the perceived quality of the home environment and its relation to subjective well-being. Interpreting residential satisfaction in later life can be particularly problematic because the construct does not embrace the experiential and emotional dimensions of place-based well-being, which can be particularly important to elders. Comparable levels of residential satisfaction have been observed in very different settings, some being
supportive of the needs of elders and others being
unsupportive and even unsafe. Indeed, a high level
of residential satisfaction among elders has
frequently been reported in objectively inferior
environments /132, 165–166/. Older people seem
to be adept at adapting to different objective living
conditions and sustaining high levels of satisfaction
/167–169/. Nevertheless, research has repeatedly
revealed that residential satisfaction is a complex
outcome of demographic and health-related circum-
stances, as well as objective and subjective
characteristics of a person's environment, for
example, the home environment /170–174/.

The role of differentiated meaning patterns
and place attachment. A sense of being in place
can foster well-being, even within what might be
considered a distinctly suboptimal environment.
Dimensions of familiarity and habituation act as a
medium of stress reduction and energy conserva-
tion. A sense of environmental confidence results
from an intimate cognitive awareness of the
configuration of the interior space of the dwelling
/15, 57/. Emotional investment in one's own place
can provide a sense of comfort, belonging, and
control over the space. Personally significant
artifacts can act as critical cues to vicarious re-
immersion in the places of a person's life /58, 175/.

In combination, each of these experiential
themes, reinforced by the presence of cherished
belongings, rituals of daily life, and the continuing
sense of identity imbued by familiar place, can
enable the individual to transcend the constraints
of a contemporary interior physical environment
and sustain an ongoing sense of being in the world.
As the person ages, environmental supports, as
experienced not only objectively but also—perhaps
even more significantly—subjectively, possibly
become more and more important for both mental
and physical health. For instance, in a study of
elders 61 to 92 years of age, with one-third in good
health, one-third suffering from mobility impair-
ment, and one-third blind, we empirically confirmed
five categories of the meaning of home /57/, namely,

1. Physical, focusing on the experience of
   housing conditions, access and furnishing;
2. Behavioral, related to everyday behavior and
to proactive ways of manipulating or rearranging
   items in the home;
3. Cognitive, representing cognitive, especially
   biographical bonding to the home, such as the
   experience of familiarity and insideness;
4. Emotional, including the experience of
   privacy, safety, pleasure, and stimulation; and
5. Social, consisting of statements expressing
   relationships with fellow-lodgers, neighbors,
or visitors.

As expected, individuals had different meaning
patterns because of their health. Besides confirming
the variety of meanings, differences among the
subgroups can be traced to adaptive mechanisms.
Different meaning patterns can serve to accom-
modate different kinds of competence loss by
emphasizing those aspects of the home that are still
accessible. Blind participants concentrated on their
social and cognitive spheres and ignored behavioral
and physical aspects of the home, whereas the
meaning patterns of the mobility-impaired
participants included behavioral aspects to a
greater extent. Such a difference possibly occurred
because visually impaired elders are more affected
in maintaining everyday life indoors compared
with mobility impaired and healthy elders.

Physical and mental health, residential
satisfaction, and being in place are clearly inter-
linked /176–177/. Nevertheless, these constructs
have seldom been considered as mutually relevant,
nor has their interrelation been empirically investi-
gated in a systematic way /178/. Again, the ongoing
European project ENABLE-AGE might provide
important insight in this regard as it integrates
these themes in an examination of functional and
meaningful housing and of direct and indirect
health outcomes /162/.
CONCLUSIONS

In this work, we compiled theoretical and empirical evidence on the link between housing and health in old age. The empirical synthesis was driven by an ordering scheme (see again Fig. 1) that was meant to reduce the complexity and to organize the diversity typical for this the field of inquiry. As expected, and taken from the perspective of the ordering scheme, we found that research on housing and health in later life so far has widely concentrated on processes of the functionality of housing and concomitant relation to direct and indirect health outcomes. Prototypical examples are housing hazards and amenities, retrofitting and environmental adaptation, and the respective behavioral strategies. As a further qualification most of the literature is framed in the classic risk factor/prevention model and considers mainly direct health outcomes.

By and large, convergent lines of empirical evidence strongly support the existing links between the functional features of the home environment and a diversity of (mainly direct) health outcomes. This finding is important because the geriatric ‘medical system’ still tends to attribute loss in competence predominantly to disease processes while neglecting environmental influences. We have much reason to argue that ‘evidence-based’ medicine today is in quite a strong position to refer to the critical role of the environment as well when considering age-related loss in competence. Hence, much stronger therapeutic and preventive use of considering and modifying the home environment is in place.

Nevertheless, in certain domains like the field of relocation or noise, the evidence is still very mixed, and more research is needed to understand the mechanisms in this regard. More generally, somewhat disappointing to see is that large data sets in this area of environmental psychological inquiry do not differentiate with respect to age or have not included a substantial number of older people. This ‘demographic ignorance’ still to be found in environmental psychology deserves future action, and we would urge scholars to consider more seriously old age as fundamental to their research design agenda.

On the other hand, we also regard as important that empirical evidence targeting the link between the meaningfulness of housing and health outcomes has begun to emerge, although such work is still rare and limited to the activities of a rather small research community. We believe that this area seems to be a fruitful one, in need of future research. Nevertheless, one should also acknowledge, for instance in areas like relocation or residential mobility, that the boundaries between functionality and meaningfulness quickly become blurred—for example, in terms of linking the functional and meaningful aspects of the (old and new) home and of the need to address the complexity of the whole process of relocation versus staying put to predict effects on direct and indirect health maintenance in old age (for example /27, 164/).

In sum, from the categorization of different levels of empirical evidence in the field by Fuller-Thomson et al. /179 (p.123)/ and from our own organizing scheme, we conclude that a gap exists between definitive and strong empirical evidence on functional housing and health links and possible and empirically under-researched bridges between the meaningfulness of housing and health. This situation is unsatisfactory because person-environment dynamics are well supported on the theoretical level. A further major goal of this review was to compile and integrate such ‘conceptual evidence’. Nevertheless, clear signs indicate that an empirical strengthening of the links between meaningfulness and health is still underway. For example, the research project ENABLE-AGE, addressing the supportive qualities of place attachment, meaning of home, and perceived usability of the home as important for healthy aging, is a key example in this regard /57, 162/.
On a more general level, one major limitation of the existing body of work is that the findings tend to appear partially fragmented and emphasize quite diverse aspects of housing—for example, in the domain of detailed hazards and adaptation at home or in the domain of residential satisfaction or meaning of home. Thus, to understand the empirical housing and health relations in old age, we feel a strong need for further integrating and synthesizing in more general terms the concepts nurtured by the search for fundamental processes and outcomes in p-e exchange in later life. Our suggestion for an analytic scheme (see Fig. 1) emphasizing two levels of housing in later life and addressing processes of ‘agency’ on the level of functionality versus the processes of ‘belonging’ on the level of meaningfulness of housing /61, 67/, can serve as a springboard to continuing this task.

Additionally, this scheme can offer a heuristic conceptual framework that can generate new questions on housing and health in later life. One critical question in this regard suggested by our framework is how long can meaningfulness compensate for deficits on the functional level—that is, a rationale and empirical evidence base for considering such trade-offs can be a fruitful research avenue in the future.

As future research and application toward the link between housing and health in later life is concerned, we would thus consider both processes as equally important from a risks and prevention perspective and from a wider experiential perspective on housing in old age. Furthermore, especially problematic is distinguishing when environmental risk ends and when prevention begins before the background of processes of biographical and behavioral adaptation to the home over decades (for example, a carpet on the floor as a reminder of the own biographical identity and handicraft capabilities versus the same carpet as a severe obstacle to enhance the risk of falls).

Nevertheless, several findings, such as on housing-related behavior, relocation, or on the impact of housing on well-being at large, clearly emphasize that both processes are linked. In terms of methodology, the following shortly phrased remarks are in place.

- First, a clear need exists for expanding interdisciplinary research, including linkages among disciplines like psychology, gerontology, anthropology, geography, occupational therapy, or medicine, geriatrics, and geropsychiatry.
- Second, the relation between housing and health in the ‘reality’ of aging is not unidirectional, as one might misleadingly presume by emphasizing our analytic scheme, but a circular process /18, 179/. Although housing can predict health-related outcomes, as has been shown, health also triggers housing decisions, options, and housing-related behavior on the levels of both functionality and meaningfulness.
- Third, many reported studies see themselves as quite limited because of methodological shortcomings, such as insufficient measurement of housing quality variables, the use of subjective self-report measures for both dependent and independent variables, or the lack of adequate comparison groups and control of confounding factors, to mention a few (for example /19/).
- Fourth, we see the need and potential to combine qualitative and quantitative methods, which may add to an in-depth understanding of the housing and health relationship.
- Fifth, striving for more longitudinal designs and making more use of state-of-the-art methodology, such as latent growth modeling or multi-level structural equation modeling, can enhance the quality of research in this field of inquiry /164/.

Finally, completing the cycle of argumentation with which we have begun this work, the impact of housing on both the older adult and the process of aging at large, namely, from birth to death, cannot be underestimated and will further increase in the
future. Enabling elders to adapt adequately to housing problems, to optimize the p-e fit, and thus to stay longer in their familiar homes is up to further research and to the best practice models of transfer into application.

Additionally, complex research designs and open-minded practitioners are needed to address simultaneously the functional and the meaningful dimensions of the home environment to fully understand the concept of housing, especially in old age, and thus to facilitate the necessary adaptations like relocation into purpose-built homes or into special-care units. This approach would lead to new perspectives beyond the classic ways of risk reduction and prevention at home—for example, through the creative development of health-related resources within the field of experiential housing, serving to enhance or to reestablish health outcomes in old age. If we succeed with a better explanation of the existing links between housing and health and with a better establishment of the potential links between housing and health, then we might argue in support of Laura Gitlin /5 (p.21)/ that the home environment would no longer be ignored or at best treated as a postscript in national discussions of public health concerns, health promotion and prevention initiatives and 'hot' geriatric topics of aging, but taken as a 'hot' topic of aging itself.

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