



UK COLLABORATIVE
CENTRE FOR
HOUSING EVIDENCE

Evidence review of home adaptations in the UK and other OECD countries

A tripartite framework

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Disclaimer

The authors are responsible for all views and any remaining errors contained in this review. The views expressed should not be assumed to be those of the University of Glasgow, University of Stirling, CaCHE or any of the project partners.



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Some useful concepts and/or abbreviations

Activities of Daily Living (ADLs) – Activities of Daily Living (ADLs) is a term used to describe the fundamental tasks that people need to manage in order to live at home independently and care for themselves. These fundamental tasks include eating, dressing, personal hygiene, continence management (using the bathroom properly), and ambulating (moving from one position to another and walking independently). These activities are also referred to as Personal ADLs (P-ADLs). The term ADLs was first coined by Sidney Katz in 1950 (Katz, 1983). It is used as an indicator of a person's functional status and level of independence. The inability to perform ADLs independently results in dependence upon others and/or assistive devices, and home adaptations. ADLs are extensively studied in the literature of adaptations.

Instrumental Activities of Daily Living (I-ADLs) – Instrumental Activities of Daily Living (I-ADLs) differs from ADLs as people sometimes ask for outside assistance when these tasks become difficult to manage independently. These include communicating with others, preparing meals, transportation, managing personal finances, and so on. I-ADLs also reflect a person's ability to live independently but are not necessarily required on a daily basis, although they are less discussed in the literature.

Participation – Participation in the context of home adaptations refers to a person's involvement in everyday activities that bring meaning to her/his life. Active participation is considered important for the health and wellbeing of people with disabilities, as well as the goal of occupational therapy and hence home adaptations. See Vessby & Kjellberg's (2010) review for an overview of how the concept had been used in the academic literature of occupational therapy.

Person-Environment Fit – An idea central to the ecological model of ageing developed by Powell Lawton and his colleagues that describes the interplay between individuals and their environments (Lawton, 1980; Lawton & Nahemow, 1973). The model has a person component denoting 'competence' such as functional capacity and an environmental component termed 'environmental press'. On top of these is 'adaptation' reflecting the matching between competence (person component) and press (environment component). The idea is widely cited, but how it can be addressed through home adaptations has not received a great deal of empirical examination.

Universal Design – The Center for Excellence in Universal Design (CEUD, 2021) has a definition of the concept as "the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability". The concept is seen in a few papers about home adaptations, but involves a whole new literature.

Usability – Usability is a person's subjective evaluation of the constraining or supportive impact of the home environment on performing ADLs (and I-ADLs). It is usually defined and understood as a three-dimensional construct, comprised of the person/social dimension, the physical environment dimension, and the activity dimension (see Fänge & Iwarsson, 2003).

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Executive summary

Background

This review is one part of **The Adaptations Policy and Practice Programme**, co-ordinated by the UK Collaborative Centre for Housing Evidence (CaCHE) and involving collaborations with the University of Stirling, Age Scotland, Horizon Housing Association, and the Housing Associations' Charitable Trust (HACT), focusing on understanding the academic evidence and policy landscape behind home adaptations. There are four complementary research activities:

1. This evidence review, led by Dr Yang Wang, which focuses mainly on scholarly articles and indexed book chapters published after 2000, as the first step in outlining key evidence around, and knowledge about, home adaptations.
2. Social Value Analysis led by Horizon Housing Association and HACT drawing on their value bank methodology to explore the social value of adaptations.
3. A policy brief led by Dr Vikki McCall (University of Stirling) which will build policy and practice recommendations from the findings of this evidence review and the social value analysis.
4. Older People's Experience of Adaptations in Scotland supported by Age Scotland with Dr Vikki McCall which will involve a national survey, a series of focus groups and interviews with older people who have applied or received adaptations in their home.

CaCHE will also conduct a focus group with service providers towards the end of the programme to consider the operational, strategic and policy ramifications of the programme's key findings.

The main objective of this review was to provide overview of what do we know about home adaptations, examining the latest knowledge advancement, identifying gaps for future research, and informing policy and practice. We directed our enquires of the literature following three questions:

1. Who need home adaptations?
2. How are home adaptations placed and what works or would work as examples of good practices?
3. What are the outcomes of home adaptations?

This led to the development of a three-dimensional framework – **Client, Process and Outcome** – which can accommodate the old, new and growing evidence, themes and theories of home adaptations¹.

¹ The main report includes a diagrammatic representation of the client-process-outcome framework.

Overview

This evidence review is concerned mainly with adaptations in relation to community-dwelling older people. There is also the need for projecting home adaptation studies and practices within the broader 'landscape' of 'inclusive living', which considers their benefits for people from all ages and disability groups (McCall, 2022; McCall et al., 2020)².

This review followed the Royal College of Occupational Therapy's (RCOT, 2019) understanding of the concept of adaptations that acknowledges that health and care needs are dynamic and change over time. This places emphasis on solutions rather than just the types of adaptations or the funding processes behind them, important as these are.

Occupational therapy is the core discipline for the study of home adaptations. The literature in occupational therapy has a long-standing tradition of exploring people's functional dependency. Yet it has been challenged by a growing emphasis on the broader outcome of health, wellbeing and life quality from various disciplines such as environmental gerontology, disability studies, health studies, and so on. This fragmented multidisciplinary literature was a significant challenge to our work.

The evidence review was assembled along the lines of other CaCHE evidence reviews involving the digital search on social science search engines using multiple exclusion criteria – e.g. a focus on peer reviewed papers in English after 2000, but including book chapters.

The digital search process yielded 706 papers falling within search criteria (after excluding duplicates and other similar anomalies). A series of further exclusions reduced this to 153. Further manual examination produced a final set of 76 papers. These are primarily about home adaptations in core Anglosphere states (i.e. the UK, Australia, the US, Canada and New Zealand) and Sweden, with a few exceptions in favour of other EU membership countries (primarily from western Europe: Germany, France, Italy and Spain), as well as Japan and South Korea. They come from a large variety of journals in various subject areas including occupational therapy, disability studies, environmental gerontology, health, housing, and ageing studies, with occupational therapy lying at the core.

Findings

The **client** dimension reviewed ways in which the characteristics of home adaptation applicants/users had been explored in the contemporary literature. Some are quite revealing and clearly demonstrate the importance of increasing our knowledge about the characteristics of adaptations clients, such as the investigation of ethnic disparities in the use of adaptations (e.g. Bakk et al., 2017) which further draws our attention to wider issues of inequality in housing and the health and social care system. Some, however, appeared to make oversimplifying claims such as studies which associated the use of adaptations with types of disease (Welti et al., 2020). They might be an oversimplification because home adaptations happen in patients' home environments where some types of disease are addressed in different ways from hospital or clinic settings. We also discussed the need for paying further attention to cohabitants.

In the **process** dimension, we tried to distinguish theory and practice. The theory section recognised the growing emphasis on considering clients' desires beyond function and safety needs in pursuit of a person-centred approach to the design of adaptations for 'effective' and 'beneficial' outcomes (in contrast to the wasteful and harmful). The theory-based themes also moved from earlier emphasis on considering the meaning of home (Heywood, 2005; Tanner et al., 2008) to more recent calls for understanding the experience of ageing (Renaut et al., 2015) and to adaptive coping strategies (Kim, 2021). The practice section focused on the frequently reported delays during adaptation services in the UK and what we called 'elective delays' that resulted from stigmatisation associated with home adaptations.

² All references are included at the end of the main report.

We organised evidence about the **outcomes** of adaptations into three broad categories: functional performance and safety, health gains, and economic benefits. While improvements of functional performance and safety as the primary focus of adaptations studies have been documented in greater depth following RCT studies, health gains and economic benefits were relatively weakly evidenced. For health gains, Heywood's (2004a) study remains the most (sometimes the sole) referred-to study, and economic benefit is an emerging topic in academic literature.

Final thoughts

We note six under-explored areas or gaps in the literature that should be addressed in future work:

- There is limited empirical evidence on social inequality and intersectionality in home adaptations in the literature.
- The significance of considering cohabitants' views in adaptations was frequently argued, but less often explored.
- The PRS tenant group remains underexplored compared to other housing tenures in research on adaptations.
- We note the absence of research assessing clients' concerns over aesthetics, although convincing evidence has been found that a hospital-looking adaptation could invoke feelings of institutionalisation as well as disability- and ageing-related stigmas, consequently affecting health and wellbeing.
- There remains a need to understand how people (both clients and professionals) experience and react to the difficulties of rationing resource allocations in adaptation services.
- Identifying and measuring health gains from adaptations is another under-explored area due to the conceptual difficulties of isolating causal health outcomes.

Finally, the review team also generated wider reflections based on thinking about the review's implications. While not necessarily new or original, these might be useful for policymakers and practitioners in Scotland to consider further.

- Promoting a renewed understanding of the concept of home adaptations among professionals that recognises the dynamic needs of people, which varies as their ageing experience vary over time and circumstance, which diversifies as their home experience diversifies, and which changes as their health needs change.
- Providing more social support as well as legislative protection for older people living in PRS, and possibly considering offering alternative funding schemes – such as providing direct funding to PRS landlords like the Physical Adaptations Grant scheme for social housing landlords.
- Considering organising independent home assessments. Relevant information can be added to the NHS health and social care database for future research use and policy design (e.g. providing data for data linkage based research on adaptations).

- Engaging and empowering clients. A default open attitude by the professional side is recommended, whereby client expertise can be valued and their preferences listened to, whilst good-quality and timely housing advice and social support services that help people to identify, reflect on and self-manage their needs and options are needed at the same time.
- Among professionals, a priority must be to ensure that client expertise can be consistently valued and preferences listened to practically and with empathy.
- Arranging post-adaptation evaluations to assess their outcomes (in particular health gains) so that best practices could be identified. Such information could join the assessment database and be made accessible to all sectors involved in adaptations – housing, health and social care – to guide practices and also be a basis for research evaluations.
- Combating everyday ageism, promoting people's confidence in talking about ageing and older age, and being conscious of ageist behaviour in practices.

1. Introduction

1.1. Background

Over the past decades, researchers have provided strong evidence that older people prefer ‘ageing in place’ (e.g. Ewen et al., 2014; Mulliner, Riley & Maliene, 2020; Severinsen, Breheny & Stephens, 2016; Wagnild, 2001), that is, they seek to remain independent for as long as possible in their own homes. To achieve this, having the suitable immediate home environment and support that “*allow them to [independently] cope with their ageing bodies*” (Golant, 2015, p. viii) is crucial, because ageing is often associated with (ongoing and foreseeable) difficulties in carrying out everyday activities and coping with changing health needs. Suitable housing also plays a key role in preventing accidents at home (e.g. fall-related injuries - Keall et al., 2015; Keall et al., 2021) and allowing swift return from the hospital (Carnemolla & Bridge, 2020[2018]). In the absence of a supportive home environment, ageing in place can in fact be a negative experience (Golant, 2015; Sixsmith & Sixsmith, 2008) and even increase the mortality risk (Rantakokko et al., 2013).

One important approach is adapting the current home environment (McCall, Tokarczyk & Pritchard, 2020; Preece et al., 2021). These works include making large changes such as widening the doorway, adding in a walk-in shower, or putting in an outdoor ramp, as well as installing small items such as a bath lift, a stair lift or a grab rail. These are known as home adaptations, housing adaptations, or home modifications³. Sometimes, a home adaptation is a provision of security (e.g. outside lights) and heating devices when they are made for the purpose of supporting easy and healthy ageing. Home adaptations can make a real difference to older people’s lives: not only do they make it easier and safer for them to move around (e.g. Petersson et al., 2009; Petersson et al., 2008), but they provide more confidence, sense of control, health benefits and many other positive socio-psychological benefits (e.g. Heywood, 2004a). Living in an adapted home was found to be a major factor that affected people’s decisions and capability around ageing in place (e.g. Hwang et al., 2011; Safran-Norton, 2010). The aim of this review was to systematically examine the research evidence on home adaptations in the international literature.

This review is part of **The Adaptations Policy and Practice Programme**, co-ordinated by CaCHE and involving collaborations across the University of Glasgow, University of Stirling, Age Scotland, Horizon Housing Association, and Housing Associations’ Charitable Trust (HACT), focusing on understanding the academic evidence and policy landscape behind home adaptations. The research activities involved in the programme aim to provide an evidence base for future research on adaptations and, at the same time, be instructive to stakeholders engaged in the delivery of adaptations in Scotland, promoting better home adaptations policy and practice. There are four complementary research activities:

- 1. Evidence review** – namely this piece of work, focusing mainly on scholarly articles⁴ published after 2000, as the first step in outlining key evidence around, and knowledge about, home adaptations. It has been led by Dr Yang Wang, supported by Professor Kenneth Gibb and Dr Vikki McCall.
- 2. Social value analysis** – led by Horizon Housing Association and Housing Associations’ Charitable Trust (HACT) drawing on their value bank methodology to explore a social value analysis of adaptations.
- 3. Policy brief** – led by Dr Vikki McCall in partnership with CaCHE which will build policy and practice recommendations from the findings of this evidence review and the social value analysis. The policy brief will include the voices of key stakeholders around the delivery of home adaptations throughout the UK. This will explore the gap between policy and practice around home adaptation, looking to map where and how adaptations sit in the UK policy landscape, with a particular focus on Scotland.

³ Home adaptations are also called housing adaptations (mainly in Sweden) or home modifications (in Australia, New Zealand, the US, etc.), or sometimes ‘repurposing’.

⁴ These include academic journal articles and indexed book chapters, but exclude academic books.

- 4. Older people's experience of adaptations in Scotland** – supported by Age Scotland with Dr Vikki McCall, which will involve a national survey, a series of focus groups and interviews with older residents who have applied or received adaptations in their home. It will highlight the general experience faced by older people when they are required to make adaptations to their homes, exploring ease of access (information, finance and accessibility of assistance available).

CaCHE will also conduct a focus group with service providers towards the end of the programme of work to consider the operational, strategic and policy ramifications of the programme's key findings.

1.2. Diverse approaches to adaptations

This evidence review is concerned mainly with adaptations in relation to community-dwelling older people. Studies on home adaptations for children and young people with diseases/disabilities were not the focus of this review, although some of the findings would be applicable as there is no clear division. There is also the need for projecting home adaptations studies and practices within the broader 'landscape' of 'inclusive living', which considers their benefits for people from all ages and disability groups (McCall, 2022; McCall et al., 2020). Their relevance to adaptations will be mentioned again in the final section.

This review followed the Royal College of Occupational Therapy's (RCOT, 2019) understanding of the concept of adaptations which acknowledges that health and care needs are dynamic and change over time. This places emphasis on solutions rather than just the types of adaptations or the funding processes behind them, important as these are.

Occupational therapy is the core discipline for the study of home adaptations. The literature in occupational therapy has a long-standing tradition of exploring people's functional dependency. Research on home adaptations following this tradition has applied a list of functional- and safety-index, such as activities of daily living (ADLs), usability, falls, fear of falling, and so on, to examine the effectiveness of adaptations. This is where most of existing review papers have been focused on. Such functional- and safety-related evidence is also attractive to governmental bodies in decision making around public expenditure on health and social care, which is supported by some (most often latent) evidence such as the reduction in care home admissions and emergency fall admissions (e.g. Hollinghurst et al., 2020; Hollinghurst et al., 2021), assuming these would save both the labour and monetary cost to the health and social care system.

Meanwhile, it has been widely recognised that reduced functional dependency does not necessarily mean a better outcome for people's health, wellbeing and life quality, or a good life and a life one is satisfied with (Heywood, 2004b; Sakellariou, 2015a,b). Reflected in home adaptations literature is the growing number of studies that take this stance to explore the multifaceted reasoning process behind adaptations in contrast to functionalism. This part of the literature is somewhat 'fragmented' because of its multi- and inter-disciplinary nature. It covers a large variety of disciplines including primarily environmental gerontology, disability studies, health studies, and some classical sociological approaches (e.g. phenomenological and anthropological) in exploring the lived experience of adaptations and ageing in place. Researchers in these fields have taken up a variety of theories and themes in advancing our knowledge about home adaptations in alignment with ageing in place. In environmental gerontology, for example, the frequently cited idea of 'person-environment fit' developed by Powell Lawton (Lawton, 1980) has had a significant influence on the development of adaptations research (Pynoos, Nishita & Perelman, 2003). Across other subject areas, discussions built around topics such as the meaning of home (Heywood 2005; Tanner, Tilse & de Jonge, 2008), aesthetics (Struckmeyer et al., 2021a; Struckmeyer et al., 2021b), needs and desire (Heywood, 2004b; Sakellariou, 2015a,b), ageist attitudes (Bailey et al., 2019), empowerment (Nord et al., 2009), and morals reasoning (Johansson, 2013) are also of immense value in advancing our understanding of home adaptations. Less mentioned was Cutchin's (1999, 2003) 'place integration' concept which sees ageing as a contingent and dynamic process which adaptation services need to consider (Johansson, Josephsson & Lilja, 2009).

In addition, there is also a small body of literature from housing studies standing aside, focusing on the delivery of adaptations (Zhou, Oyegoke & Sun, 2019,2020; Zhou et al., 2020) and on policies (Mackintosh, 2020; Mackintosh & Heywood, 2015).

The main objective of this review was to provide an overview of what do we know about home adaptations, examining the latest knowledge advancement, identifying gaps for future research, and informing policy and practice. We directed our enquires of the literature following three questions identified at the beginning: 1) Who need home adaptations?; 2) How are home adaptations placed and what works or would work as examples of good practices?; and 3) What are the outcomes of home adaptations? This led to the development of a three-dimensional framework – **Client, Process and Outcome** – which can accommodate the old, new and growing evidence, themes and theories of home adaptations.

Previous review papers (including meta-analyses, listed in Appendix 1) were especially helpful for us in examining evidence on the outcome dimension because they focus extensively and most of the time exclusively, on the outcome of adaptations, especially functional- and safety-related outcomes (Chase et al., 2012; Cumming, 2002; Feldman & Chaudhury, 2008; Lord, Menzi & Sherrington, 2006; Wahl et al., 2009). Two very recent ones have a slightly wider focus on the effects of adaptations on social participation, health, quality of life, etc. (Carnemolla & Bridge, 2020[2018]; Lim et al., 2020), and there is another one which is specifically about participation outcomes (Stark et al., 2017). Yet most of these reviews were concerned with multifactorial interventions in which adaptations were one component alongside others like the use of assistive technology, training, environmental hazards assessment, etc. Our review will focus on adaptations as a single intervention.

Another objective of conducting this review was that we hoped to consider the implications of current evidence on what a good adaptation is or would be and what approaches, ideas and future evidence we can look at in order to improve adaptation services in Scotland and across the UK.

In the UK, and in some other OECD countries like Sweden, local authorities have the statutory duty to fund home adaptations and provide relevant advice, information, and support to get the work done. Under the current system, most home adaptations made for home occupiers and private rent sector (PRS) tenants in England, Wales and Northern Ireland are funded through the Disability Funding Grants (DFG) scheme which came into being firstly in England in 1997. Yet its history goes back to the “Staying Put” projects in the early 1980s to early 1990s (see Leather & Mackintosh, 1993, among others). In Scotland, they are funded through The Scheme of Assistance. Home adaptations made for social housing tenants, however, are funded differently, such as through the Housing Revenue Account (HRA) or the Physical Adaptations Grant (PAG) under which funding is allocated directly to the landlord. The provision of a home adaptation more or less follows a five-stage process (Zhou et al., 2020b) which consists of referral, allocation, assessment, funding and installation, although this varies across different local authorities. Its administration falls within the responsibility of multiple departments/sectors, in particular the health and social care sector and the housing sector, with the former carrying out home assessment and the latter providing grants, and involves collaborations between the client, occupational therapists (OTs) and/or other allied health professionals (e.g. physiotherapists), health and social care workers, housing officers, contractors, etc. There are also a number of national-level charitable bodies which provide advice, information, and practical assistance with funding applications, as well as home assessment services, namely Care and Repair England, Care and Repair Scotland, and Care and Repair Cymru. Alternatively, people may self-fund their adaptations.

Over the decades, there have been continuous criticisms of the country's adaptation services by academics. There is also a persistent and large gap between the number of people who need adaptations and the number of adapted houses (Equality and Human Rights Commission, 2018). Successive UK Governments and, more recently, the Centre for Ageing Better⁵, have led several highly revealing research reports assessing the delivery of home adaptations and proffering guidance or recommendations. The Welsh Government also has a track record of assessing its home adaptation services since the publishing of the Jones Review (Jones, 2005). Although this grey literature was not the focus of this evidence review, and Dr Vikki McCall is leading that part of the work, we note its richness and the importance of not discussing academic evidence without referring to the discourse of policy and practice. Therefore, we do refer to key research reports in this review to contextualise our discussion.

1.3. Review structure

This review is structured as follows. The method section, which immediately follows, outlines the review methodology, explaining the literature search and paper selection strategies, the review process, and limitations. It then presents the richness, nuances and complexity of the evidence in the academic literature through defining and developing the proposed client-process-outcome (CPO) framework. The final section concludes the review by summarising the findings and discussing areas of future research as well as implications for adaptations policy and practice.

⁵ Centre for Ageing Better, established in 2015, is a charitable organisation funded by the National Lottery Community Fund with a vision of creating a society where everyone enjoys later life (Centre for Ageing Better, 2021a). It is part of the UK Government's What Works network, which uses independent evidence to push for better decision-making in a range of public policy areas.

2. Method

2.1. Strategy for literature search

Methodologically, this evidence review took the ‘systematic literature mapping’ approach which has been adopted in, and developed from, a series of review projects undertaken within the UK Collaborative Centre for Housing Evidence (CaCHE) (see, for example, Serin, 2018a,b; Soaita, 2018a,b; Soaita, Gibb & Maclennan, 2019; White & Serin, 2021; see also Soaita, Serin & Preece, 2020).

In line with several of CaCHE’s previous evidence reviews (e.g. Soaita et al., 2019; White & Serin, 2021), two frequently used bibliographical databases – namely Scopus and Web of Science – were selected for searches of academic publications (i.e. peer-reviewed journal articles and indexed book chapters). These two databases were found to cover most published academic material in Serin (2018a) contributing 96% of the final databases, and Scopus provided over 92% of the sources in Soaita (2018b).

This was complemented by a manual search using Google, via snowballing the references of some key papers, and drawing on the team’s prior expertise and knowledge.

Following a team meeting, five home adaptations terms were identified and translated into a ‘Boolean String’ which was then inputted into the two databases to retrieve relevant publications. These five terms are ‘housing adaptations’, ‘home adaptations’, ‘home modifications’, ‘accessible housing’, and ‘adaptable housing’. They were linked with the Boolean connector ‘OR’ to create the following search string: (“housing adaptation” OR “home adaptation” OR “home modification” OR “accessible housing” OR “adaptable housing”). The search was conducted on 15 September 2021. Only publications available in English were included.

2.2. Paper selection and review

Initial queries (without restrictions to the publication date and geographical focus) on the titles, abstracts, and keywords of the articles and book chapters in *Scopus and Web of Science* returned a list of 1,051 papers (Scopus 613, Web of Science 438). The number was reduced to 706 after removing 355 duplicates using EndNote.

A set of exclusion criteria were then applied to ‘filter’ these 706 papers to create a sample of manageable size for the limited timeframe of the project, but without compromising on comprehensiveness and rigour. The criteria listed in Table 1 were agreed by the team, who also assisted with this ‘filtering’ process. The papers were screened by title and abstract. This process reduced the sample size down to 153.

Table 1. Exclusion Criteria for Initial Paper Selection

- Papers *published before 2000*⁶
- *Editorials, commentaries, and book reviews*
- *Analysis of home adaptation policies, legislations and industrial standards*
- *Meta-analysis and systematic review papers* – Meta-analysis and systematic review papers were not included in the evidence base. Yet, they do provide a picture of what researchers in this field have been focusing on, and what is insufficiently done to which this evidence review could be contributing and revealing.
- *Papers that are not primary research studies*
- *Simulation studies* in which data were generated by computer experiment rather than collected from the real world
- *The same study which was published in different forms*, i.e. a study published in academic journals first and included in an edited book later
- Papers presenting *similar outputs*, often from the same author(s)
- Studies focusing on *non-OECD member countries*
- Papers which are *out of the context of adapting the home environment for ageing*, such as papers about making adaptations for other purposes such as energy-saving, and papers about adapting the environment for ageing but in nursing homes
- Papers about *home adaptations for children and young people with disabilities* that restrict their mobilities, for example, children with cerebral palsy disease, young people suffering from multiple sclerosis, etc.⁷
- Papers concerning *home adaptations for adults with autistic spectrum disorder*⁸
- Papers about *home adaptations for adults with disabilities caused by accidental injuries* such as incident traumatic brain injuries⁹
- Studies *investigating functional and cognitive impairments, coping strategies taken, healthcare services received, needs, costs, etc. of people experiencing ageing-related inabilities, disabilities, illnesses and recoveries, or fall injuries and recoveries* – Although these studies are not directly related to home adaptations, we view them of high importance because they do reveal people's varied needs for adapting the home environment to support independent living and ageing-in-place. They make another body of evidence.
- Clinical trials in which *home adaptations is a part of multifaceted interventions/programmes* (usually for falls prevention)¹⁰.
- Papers exploring the outcomes of *joint use of assistive technologies and adaptations*¹¹
- Studies discussing time-sensitive topics/issues of home adaptations. For example, papers discussing the use of televideo technology in home assessment services in the early 2000s, or historical studies of specific projects/programmes in the early 2000. These studies were excluded as technologies have advanced dramatically since then, and policies and practices of home adaptations in different countries have been changing along with policy adjustments in the healthcare and the housing sectors.
- Studies exploring contemporary use of smart technologies and IoT (Internet of Things) in home adaptation services but with a focus on the *user experience of a specific tech-application*

⁶ In fact, the large majority of the 706 papers were published after 2000 (N = 618).

⁷ They were excluded as the main focus of this review was adaptations for community-dwelling older people.

⁸ See above reasons.

⁹ See above reasons.

¹⁰ For these interventions, it is not possible to separate the impact of home adaptations from other inputs.

¹¹ See above reasons.

Following the initial selection, the 153 papers were labelled against their thematic relevance to a drafted *Client-Process-Outcome (CPO)* theoretical framework. The framework was first developed from an initial set of themes identified during the abstract-screening stage. It was further developed, refined and established while the review was progressed.

Meanwhile, a few more inclusion-exclusion criteria were applied to further filter the papers. First, papers that did not directly engage with the key themes in the CPO framework were excluded. Second, papers deemed to be of low quality were dropped. This was mainly based on the assessment of whether the aims, objectives, or rationale of the study reported in each paper were explicitly stated, whether the findings were clearly linked to the objectives, and if the methodology was transparent and sufficiently rigorous (i.e. was the paper explicit about the methods used, including limitations of the approach, sampling strategy, sample size, etc?). Third, in some papers, such as Stark et al. (2009), 'home modifications' is used as a broader term which refers to interventions including home adaptations, re-arrangement of furniture, home-hazard counselling, provision of assistive technology, and relevant training in using the environment and home modifications. These papers were also excluded. Fourth, in terms of inclusion, we kept all studies focusing on the UK cases that also passed the thematic and quality checking. We viewed these UK-focused studies as being of direct relevance, and read and reviewed them in greater depth, because one of the objectives of this review (in line with the aim of the overall project) is to provide policy implications for home adaptation services in Scotland, and possibly throughout the UK. Similarly, special attention was also given to papers with a focus on countries, in particular Sweden, where the organisation of adaptation services is akin to the UK.

A separate point to make is that we were keen to be on guard against simplistic policy/practice transfer across countries such as the US to UK, or France to UK. Home adaptations in the US are largely provided by private service providers. Most people pay for adaptations themselves, even for small hand rails. Major policies addressing the challenges of an ageing population in France have made little reference to housing until quite recently (Renaut et al., 2015).

The final sample consists of 76 papers which form a core evidence base. These 76 papers are primarily about home adaptations in core Anglosphere states (i.e. the UK, Australia, the US, Canada and New Zealand) and Sweden, with a few exceptions in favour of other EU membership countries (primarily from western Europe: Germany, France, Italy and Spain), as well as Japan and South Korea. They come from a large variety of journals in various subject areas including occupational therapy, disability studies, environmental gerontology, health, housing, and ageing studies, with occupational therapy lying at the core. A large number of them are fall-related studies, in which home adaptations are specifically viewed as an intervention to prevent falls. In fact, these fall-related papers do not add much in aggregate. The majority were published in the last five years.

The manual search also identified a small number of additional articles that were relevant to the evidence review but were not identified in the literature search. They made a small but valuable contribution to the overall review. It is important to note that this additional set of papers was included in the review because of their thematic relevance rather than for the purpose of comprising an exhaustive list of published research on the study topic.

2.3. Limitations

This review has several limitations. First, our effort of separating home adaptations from other interventions inevitably will have missed or excluded some articles that readers might consider relevant. Second, this review took a critical perspective on which themes to report. High frequency was not necessarily viewed as suggesting significance. Third, the review process did take longer than originally anticipated. This delay might have resulted in the exclusion of some relevant journal articles that were published after the initial paper selection was completed. Practically, however, there always has to be a cut-off point. Finally, this review focuses on literature published in English only, which is a limitation of an evidence review with an international focus (i.e. the OECD countries).

The following sections present a narrative discussion of evidence related to the key themes within the Client-Process-Outcome framework in detail.

3. Review of the evidence: a tripartite organising framework

In this review, we propose a three-dimensional theoretical framework to organise the key themes that emerged in the literature. The first dimension is the **client** of home adaptations – concerning the characteristics of the applicants for, or users of, home adaptations. There is also an additional theme that is closely related to this dimension, namely the **cohabitant** of the client. The second dimension is the **process** of home adaptations – focusing on the complex, multifaceted nature of the provision of adaptations in both theoretical and practical contexts. The third dimension is the **outcome** of home adaptations – considering how home adaptations improve older people’s functional performance and safety, health and wellbeing, and how adaptations bring economic values to the healthcare sector. This **Client-Process-Outcome (CPO)** framework is not only a structured portrait of research themes that emerged in the home adaptations literature to date, it also provides an encompassing yet simplified view that is both accessible to those who are new to the idea of home adaptations and comprehensive to those who are already familiar with it. Furthermore, the CPO framework is an amendable and testable theoretical framework. As knowledge grows in specific fields within each of these dimensions, a more comprehensive understanding can be reached.

3.1. The client dimension of home adaptations

The clients of home adaptations in the context of ‘ageing’ are highly heterogeneous. They vary in terms of a considerable number of interconnected characteristics including disability (types and/or levels), health condition (defined as diseases/illnesses), age (although they all tend to be older adults), and many other sociodemographic characteristics. Dedicated enquires about their characteristics and heterogeneity have been viewed as a primary step towards the planning of more targeted adaptations and effective allocations of funding and resources to people in most *need*¹² of them (Boström et al., 2018; Luther et al., 2020; Tabbarah, Silverstein & Seeman, 2000; Thordardottir et al., 2015). In recent years a growing number of papers with such an objective has appeared. Their authors approached the topic with different focuses/emphases as presented in turn below.

3.1.1. Clients by ‘disability’

We would like to start with a very recent study from Luther et al. (2020), in which the authors tried to stratify the applicants of home adaptations grants in Sweden based on their age and several aspects of their housing and health condition, including ‘dependence in ADL (activities of daily living)’, ‘number of functional limitations’, ‘cognitive impairment’, ‘concerns about falling’, and ‘satisfaction with usability in the home’. The study, conducted to, using the authors’ words, “strengthen the validity” (Luther et al., 2020, p. 2028) of the findings in an early one carried out by the same research team – Thordardottir et al. (2015), outlined five groups of applicants: ‘older adults with low level of disability’, ‘older adults with medium/high level of disability’, ‘adults with low level of disability’, ‘adults with high level of disability’, and ‘older adults with medium level of disability including at least moderate cognitive impairment’ (Luther et al., 2020). Applicants classified as ‘older adults with low level of disability’, for example, are those characterised by:

old age, low level of ADL dependence, low number of functional limitations, no/mild cognitive impairment, low level of concerns about falling and usability of the home rated high for all three aspects (self-care, social relations, leisure/outdoor) (Luther et al., 2020, p. 2030).

¹² Sakellariou (2015a,b) distinguished between need and desire, and brought in Mol’s (2008) idea of logic of choice to argue how the enactment of logic of choice in the context of home adaptations in the UK could be based on the neo-liberal language of cost-effectiveness which downgrades people’s desires of living a good life. This issue will be further discussed in a later section.

The study is quite inspiring because, notably, 'ADL dependence', 'fear of falling', and 'usability' were more often examined as the predictors and/or outcomes of having adaptations and less as the characteristics of the clients, and usability is conceived of more as a measure of the condition of the clients' home environments than of characteristics of the clients *per se*. It therefore provided an innovative perspective to look at the profile of home adaptations clients, through which measures of other person- and environment-specific characteristics can be considered, tested, and included. In fact, Thordardottir et al. (2015) had observed stark differences with regard to 'participation frequency and satisfaction in and outside the home' and 'self-reported health' among the six applicant clusters they identified in their research.

3.1.2. Clients by ethnicity

Although not as ambitious as the abovementioned research, studies investigating the basic demographic characteristics of home adaptations users seemed to be more revealing because they identified the underrepresented groups which practitioners should be looking to support. Two studies, by Bakk et al. (2017) and Meucci et al.'s (2016), both using data from the first wave (2011) of the National Health and Aging Trends Study in the US, found evident ethnic disparities in the use of a few types of minor adaptations (e.g. a grab bar or a raised toilet seat) among Americans aged over 65. More specifically, Black and Hispanics reported fewer uses of those minor adaptations compared to White non-Hispanic. Similarly, a much earlier study from Tabbarah et al. (2000) which also drew on analyses of secondary data (AHEAD – the Survey of Asset and Health Dynamics of the Oldest Old) revealed a steady underrepresentation of community-dwelling Hispanics and African Americans over 70 years of age in the use of non-structural (i.e. minor) adaptations when controlling for their economic, housing, and health conditions. More recently, Lam et al. (2021) and Ng et al. (2021) both observed the unmet needs and low uptakes of bathroom adaptations associated with non-Hispanic Blacks and Hispanics compared to White non-Hispanics. An interesting finding in Bakk et al.'s (2017) study worth mentioning is that the ethnic disparities were found to be largely explained by English proficiency, but less determined by Medicare¹³ needs and had little to do with education. Bakk et al. (2017) hence called for increasing social supports in the planning and implementation of home adaptations, such as providing language support.

The issue of ethnic disparities in the use of adaptations was also seen in the UK. Ewart & Harty (2015) discovered that non-white households were more than twice as likely to be in need of adaptations as white households, but significantly less likely to have what they needed, based on their analysis of data from the 2003 English House Condition Survey (then English Housing Survey).

These studies are quite revealing because they highlighted the need for addressing the inequality issues within the housing and the health and social care system if home adaptation services are to play a role in facilitating more inclusive ageing. It is not only the inequality found across ethnicities in these studies that we should pay attention to: other issues of social inequality associated with housing tenure, housing quality, access to services, social class, or cultural bias also need to be heeded. In Meucci et al.'s (2016) study, individuals who have lower educational attainment and less social connectedness or family support (small social networks and divorced) demonstrated a lower likelihood of using home adaptations. Ewart and Harty (2015) raised an anecdotal perception within the healthcare professions in the UK that: Asian households were socially structured to provide care for family members leading to a lower uptake of home adaptations within Asian communities. However, studies exploring issues of social inequality in the use of home adaptations like these are scarce in the literature.

¹³ Medicare is the national health insurance program in the US.

3.1.3. Clients by health condition

Alongside investigating demographics, Tabbarah et al. (2000) also developed a 'health profile' of home adaptations users, which involved measuring their 'health conditions/events'. Six classes of health conditions (i.e. types of diseases) and three health events were measured. They were whether people had ever had arthritis (including rheumatism), cancer (excluding minor skin cancers), heart disease (including chronic bronchitis and emphysema, but excluding asthma), diabetes, and stroke, as well as fall, hip fracture, and joint replacement (Tabbarah et al., 2000). Amongst these, cancer, diabetes, stroke, and joint replacement were found to be associated with a higher likelihood of using adaptations (Tabbarah et al., 2000).

While the different needs between people with functional disabilities and those with cognitive impairment such as dementia have been widely recognised (e.g. Damme & Ray-Degges, 2016; Marquardt et al. 2011; Struckmeyer & Pickens, 2016), the nuances across different types of disease as shown in Tabbarah et al.'s (2000) study have not received much attention. One recent study that looked into the theme is from Welte et al. (2020). Their study examined the associations of the varied use of adaptations with major health conditions/events among women users only, in which only modest associations of the use of adaptations with cardiovascular-related diseases (atrial fibrillation, heart valve disease, stroke) were observed (Welte et al., 2020). Another is Kim et al.'s (2014) study which found older adults living with hypertension or heart disease were significantly more likely to adapt their homes than those without specific medical conditions and those with four other chronic medical conditions, namely dementia, cancer, arthritis/back pain, and diabetes.

3.1.4. Clients by varied use of home adaptations

The majority of the aforementioned studies involved quantifying the use of home adaptations as a dependent variable. Usually, a dichotomous variable was created to indicate the 'presence' (use) or 'absence' (not use) of a specific type of adaptations in people's homes – for example, minor adaptations or bathroom adaptations. One exception was Welte et al. (2020) which used a 'latent HEM classes' measure (HEM refers to 'home environmental modifications', i.e. home adaptations) to classify the clients based on their varied uses of adaptations. The 'latent HEM classes' measure was made up of four cohorts of women clients who reported different uses of home adaptations (Welte et al., 2020; see also Beavers et al., 2020). The four groups were 'low HEM use', 'railings/grab bars', 'lighting/declutter', and 'lighting/declutter'. 'Low HEM use' was the most common group type, which was characterised by low use of any HEM, accounting for 58% of the research sample. It was followed in turn by the 'railings/grab bars' group – which features women who reported the use of hand rails and grab bars (making up 21% of the sample), the 'lighting/declutter' group – which denotes women clients who reported improving lighting and decluttering the home environment (making up 18% of the sample), and the 'high HEM use' group – which characterises clients who reported substantive use of multiple HEM (making up the remaining 5% of the sample, and also the smallest group) (Welte et al., 2020). Nevertheless, labelling client groups by their varied use of adaptations would have no practical use if it were not linked to the characteristics of the clients, since it ought to be the needs of the clients that determine what adaptations should be provided.

3.1.5. Cohabitants

When talking about clients, we should not forget their cohabitants (partners/spouses) and/or other informal carers (i.e. close family members, friends and neighbours who look after them). Cohabitants play a vital role in clients' decisions of having adaptations, both as a source of information and advice and in response to the demands of caregiving (Ekstam, Fänge & Carlsson, 2016). On some occasions, they play a decisive role. For example, Ekstam et al. (2016) found an older person's decision to have adaptations could have resulted from 'pushes' from her/his cohabitant or other family members when the person in question was still unsure about whether to have them or not. Moreover, it is also important for practitioners to consider cohabitants' opinions or work collaboratively with them so that the full scope of the 'problem' can be understood and clients' needs can be best met, since it is they who witness the clients' domestic experience on a daily basis.

A home adaptation is not merely an intervention that is supposed to be creating a home environment solely beneficial to its client in performing ADLs with less dependence. It eases cohabitants' caregiving tasks and produces health effects to them (Heywood, 2004a, 2005). In Granbom, Tai and Ekstam's (2017) study, home adaptations were explicitly applied for to facilitate caregiving tasks for cohabitants. Caregivers' opinions are especially important to consider when designing adaptations for people who have dementia (Damme & Ray-Degges, 2016). Heywood (2004a) also found convincing evidence on how an adaptation could cause health problems to the cohabitants if it was poorly designed. In addition, it could also affect the relationship between the clients and others. Heywood (2005) observed how older people themselves felt burdened by dependency before adaptations and were conscious of the threat it (the dependency) posed to their families, and how adaptations could worsen the situation "if the function of home as a place where relationships between people need to flourish is not understood" in the decision-making process. (p. 544). However, arguably, researchers have put too much focus on clients, and have consequently overlooked their cohabitants' needs and their user experience, as caregivers, of adaptations.

3.2. The process dimension of home adaptations

The second dimension concerns the process of home adaptations. We divide the evidence into two sections: theories and practices. Theoretical discussions about the adaptations process in the literature have been predominated by an emphasis on the importance of looking beyond functional and safety indexes to consider people's lived experience when assessing their needs and designing adaptations. We identified five key themes that best demonstrate this 'trend' and combined them in the theories section with a discussion of home assessment. Then, in the practice section, we turn to review studies on the issue of delays and what we call 'elective delays' in adaptation services with a specific focus on the UK context.

3.2.1. Theories

Quality adaptation starts with efficient home assessment. A home assessment is usually carried out by an occupational therapist (OT) (sometimes by a social worker or other health professionals – we refer them to 'professionals' below) through a home visit, although remote assessments facilitated by digital technology have been undertaken in recent years. Professionals visit the clients' homes to understand their *needs* and then plan adaptations accordingly. Home assessment may only focus on the specific problem areas or activities that would be targeted by adaptations. It could also involve a comprehensive examination of the whole environment. Furthermore, home assessment could constitute an intervention in its own right.

Professionals may use standardised assessment tools to structure the evaluation. There is quite a number of standardised assessment tools (see Appendix 2 for a list of available standardised assessment tools¹⁴). Alternatively, they make judgements based on unstructured interviews or observations during home visits. Fänge and her colleagues found most OTs in Sweden never or only occasionally used structured assessment (Fänge, Lindberg & Iwarsson, 2013), and in their study advocated the use of standardised assessment tools for more effective interventions (Fänge et al., 2019). However, when Fänge et al. (2019) put a standardised assessment and evaluation protocol into an experiment study, no convincing evidence was found that could support the idea that applying such a strategy to home assessment, in comparison to non-structured practices, would result in a statistically significant improvement in fall-related outcomes, ADLs, usability, participation, and health-related life quality. Carlsson et al.'s (2017) study, which also compared the effects of standardised research-based practice and ordinary practice, did not find significant differences between them either. In fact, Patry et al. (2019) found there is a lack of demonstrable psychometric properties (e.g. validity, reliability, etc.) of standardised assessment tools.

¹⁴ An interesting fact is that almost all of these currently available standardised assessment tools were developed by US scholars.

Strong evidence was found in favour of a person-centred approach, at the heart of which is the call for active engagement with the client, understanding their lives, ageing experiences, preferences, expertise, etc., beyond fulfilling basic functional and safety needs (e.g. Johansson et al., 2009; Renaut et al., 2015; Sakellariou, 2015a,b). This highlights the complex and multifaceted nature of home assessment and adaptations. In addition, there could also be contingent and pragmatic issues to consider. For example, Thordardottir et al. (2019) found ADLs performance was a moving target, varying from day to day. This means that on a 'good day', activities such as self-care and moving around at home could be easily performed. When asked if there was a problem performing a certain task on such a day, the client would be more likely to give optimistic responses to the effect that they could do it 'okay' and a home adaptation was not necessary. In contrast, when the question was raised on a 'bad day' when getting over the one remaining threshold became too difficult, she/he might realise that an adaptation was needed. Sometimes, there are ethical dilemmas (Fänge et al., 2013) and issues around moral reasoning (Johansson, 2013) to deal with. For instance, Fänge et al. (2013) reported some OTs in Sweden found themselves trapped between constraints posed by the granting authority and the needs of clients.

In any case, the reasoning could vary across professionals from different sectors (Burns et al. 2017) with different educational backgrounds (Fänge et al., 2013), at different stages of their career (DuBroc & Pickens, 2015). For instance, Burns et al. (2017) found different professionals focused on different aspects of the clients' needs, and thus applied different knowledge and tactics in home assessment. Specifically, Burns et al. (2017) observed that social workers had a broader perspective on ageing at home, and OTs often looked more closely at health and functional issues, whereas professions with a background in design emphasised ageing and universal design. Burns et al. (2017) therefore suggested that with multidisciplinary expertise, a balanced understanding of clients' needs might be achieved, although more empirical evidence is needed about the outcome differences between single-professional and interprofessional interventions.

Below are a few frequently discussed themes and/or outstanding arguments that we think best exemplify the complex and multifaceted nature of home assessment and adaptations. This list is not exhaustive and our discussions only focus on publications after 2000.

Meaning of home

A home is more than a shelter. It holds a series of meanings for older people. The idea of considering the meaning of home in home adaptations is well established. Drawing on evidence from 104 interviews with people from seven local authorities in England and Wales who had major adaptations, Heywood (2005) demonstrated the ways in which a set of meanings of 'home' could be threatened by insensitive home adaptations, in which the adaptation works were ineffective, wasteful or even harmful. These meanings included primal security, privacy, control over decisions, freedom to act (autonomy), reflection of self (identity and achievement), as a place to foster relationships, one for the nurture of children, a nodal point from which to go out (to participate in social life) and return, and rootedness (Heywood, 2005). Tanner et al.'s (2008) study sampled people living in public housing and exemplified how home adaptations strengthened the home as a place of personal and social meanings for people alongside improving safety and comfort. Aplin, de Jonge and Gustafsson (2013, 2015) further crystallised different meanings of home into a six-dimensional theoretical construct – personal, societal, physical, temporal, occupational, and social (for a detailed explanation, see Aplin et al., 2013, pp. 101-103) – to investigate how they positively/negatively influence older people's decision-making regarding home adaptations. These studies offer intriguing clues about why it is essential that home adaptations policies and practices go beyond valuing safety and functional improvement, and embrace the value of other meanings of home as held by older adults in order to contribute to their health and wellbeing in a broader sense.

In light of the recent surge of discussions on the negative effects of COVID-19 on the population's health, Gurney (2020) applied a social harm perspective to discuss how the home can be a place where harm occurs, instead of focusing on the taken-for-granted *"positive narratives and associated psycho-social benefits home affords"* (p. 8). There is also the Centre for Ageing Better report which noted that poor-quality homes contributed to COVID-19 infections and other health issues for older people (Centre for Ageing Better, 2020). These perspectives bring to the fore the issue of how and why home adaptations should be designed and delivered in a way that enhances, not harms, older people's positive experience of home as a locus for, as discussed in Heywood (2005) study among others (Aplin et al., 2013, 2015; Tanner et al., 2008; also Haak et al., 2007a; Haak et al., 2007b; Hawkins & Stewart 2002) security, privacy, control, freedom, identity, relationship, hope and participation, amongst many other meanings.

Aesthetics

Clients' concerns over aesthetics appeared to be another frequently reported theme. A very recent review from Struckmeyer et al. (2021b) discovered that there was no appropriate approach for the assessment of clients' aesthetic concerns. Moreover, Struckmeyer et al. (2021a) found both professionals and clients prioritised different aspects of adaptations over attractiveness, although clients may place more value than professionals upon attractiveness. However, the fact that a hospital-looking adaptation could invoke feelings of being institutionalised as well as disability- and ageing-related stigma has been well captured in many studies (e.g. Aplin et al., 2013; Burns, Pickens & Smith, 2017; Granbom et al., 2017; Tanner et al., 2008), which explains the low social acceptance of adaptations, how the negative impacts could go beyond function and safety to more broadly defined health and wellbeing, and why adaptations are also about design.

Experience of ageing

Researchers in environmental gerontology have identified the need for understanding 'ageing in place' as a progressive process (e.g. Cutchin, 2003; Golant, 2003). Johansson et al.'s (2009) study was a revealing one in adaptations literature which explored how older people used their creativity and initiative (e.g. functional capacity, social support, and home adaptations) to create 'possibilities of action' – possibilities to perform activities in accordance with their values and preferences, through their spirals of 'place integration' – which is Cutchin's term for the progressive nature of 'ageing in place'. They suggested that adaptation services *"should be directed towards increasing possibilities for action rather than only facilitating activity performance"*, and recognise service-users' creativity and effort as *"resources in design and provision of services"* (Johansson et al., 2009, p. 49).

Renaut et al.'s (2015) study, carried out in France, focused on older people's creative responses to ageing within the context of the home environment and articulated another dimension of ageing experience, namely that individuals' experience of ageing and adaptive responses (such as changing behaviours or adapting the home environment) are contingent on their 'self', varied social and cultural capitals, and social norms. As they described it: *"the way growing old was experienced by a retired doctor living in a comfortable apartment in a well-off district of Paris was not the same as that witnessed by the partner of a former miner living in a declining provincial town in northern France"* (Renaut et al., 2015, pp. 1288-1289). Notably, this was another piece of evidence that demonstrated the need for exploring social inequality issues in adaptations.

Kim's (2021) study serves as a good example of how knowledge of clients' ageing experience might be 'technically'/'practically' obtained. Kim (2021) compared the environmental hazards at older adults' homes identified by observers (i.e. professionals) using an assessment tool and those perceived by the residents, and found statistically significant discrepancies between the two. Specifically, residents identified fewer environmental hazards than observers and their (observers vs residents) opinions differed on what they considered to be environmental hazards (Kim, 2021). Instead of overstating the weakness of residents' perceptions in comparison to observers', Kim (2021) explained their discrepancy by referring to Golant's (2011) theoretical model for adaptive coping strategy in late life: accommodation and assimilation. The former is a mind-changing strategy whereby people adapt their personal needs to fit changing circumstances (e.g. when their home environment cannot meet their needs), while the latter intends to adapt the circumstances to fit personal needs. Kim (2021) argued that it could be the case that the accommodation strategy failed to identify those environmental hazards that the observers identified. The assumption was: through adapting their needs, people might have had become familiarised with their environments even if there are undesirable circumstances, and therefore no longer saw a problem as a hazard (Kim, 2021). On the other hand, those who used the assimilation strategy to modify their environments tended to identify problems that the observers would not consider as environmental hazards (Kim, 2021). Kim (2021) thus further argued the importance of understanding older adults' adaptive coping strategies in response to functional loss, combining insights from both worlds to "provide in-depth knowledge to develop design strategies that support adaptive behaviors in older adults" (p. 17).

Control and empowerment

In papers mentioned previously such as the writings about the meaning of home, we found ample evidence that when adaptations are forced upon people against their wishes they may be deemed as invasive interruptions to their experience of 'home as a place of control', which then cause de-valuation of the adaptation work (Aplin et al., 2013, 2015; Heywood, 2005; Tanner et al., 2008). For example, in Tanner et al.'s (2008), there is a piece of vivid narrative of a lady's negative experience:

The participants was a widow who lived alone in a house she had occupied for over 40 years. [...] During the interview, she revealed that she did not initiate the request for modifications nor did she expect the extent of modification that occurred. She spoke frequently about the loss of her "old" home and the disruption to routine and habits due to the modification design. The one aspect of the modifications that she was happy about (the small ramp at the front of the property) she stated several times during the interview was "her idea." This is perhaps the one change she felt was in her control and for which she felt a sense of personal ownership.
(Tanner et al., 2008, p. 206)

Sense of control was also found to influence clients' compliance with OTs' recommendations (Bianco et al., 2020).

Meanwhile, there was strong evidence of how empowerment – in the way that clients' needs were respected, in cases where they had effective communication with the professionals, or when they felt they had control over decision-making processes – could strengthen clients' satisfaction with the outcome (e.g. Bianco et al., 2020; Burns et al., 2017; Nord et al., 2009; Picking & Pain, 2003). Picking and Pain (2003) even found some older people preferred to organise their own adaptations if they were given sufficient information and choice. It is therefore invaluable for professionals to maintain an attitude that shows sensitivity to clients' wishes for control over the decision-making in relation to adaptations, understanding those wishes as a need and making opportunities available. This needs to be built into the practice and supported by training.

On the other hand, a lack of professional knowledge and expertise, as well as a lack of capacity to deploy resources (e.g. information or social support), could put the clients in a weak position within the client-professional relationship. Most often, they have to rely on, and trust, the professionals during the adaptations process. Thus, empowerment may only be achieved with improved availability of information, advice and social support.

Also of equal importance is effective communication between clients and professionals. However, there were few studies found on this topic.

Need vs desire^{*15}

We have highlighted the word need several times. In a footnote in Section 3.1., we mentioned Sakellariou's (2015a,b) studies which distinguished *need and desire*. Below, we further explain this important issue based on Sakellariou's (2015a,b) two narrative-based studies.

In the first study (Sakellariou, 2015a), he presented the experience of a couple, [one of whom had Motor Neurone Disease (MND)] applying for adaptations that would not only reduce the physical barriers, but also enable them to 'sleep together' (sharing one bedroom). As he observed, the couple had to "*constantly defend*" their wish to 'sleep together', which was only recognised as a desire against what the professionals regarded as "*necessary and appropriate*" for their needs (Sakellariou, 2015a, p. 463). In the second published study, Sakellariou (2015b) recounted a story of a woman, again diagnosed with MND, whose applications to obtain the adaptations she wanted were rejected twice: the first rejection due to the perceived quick progression of the MND and the second because of the actual 'slow' progression of her MND. In both cases, she paid for her own solutions. In both studies, the official (professional and political) discourse of home adaptations prioritised expected outcomes relating to identified needs – "*activities that the persons must carry out to mitigate the effects of functional limitations*" – over those reflecting people's desires – "*wishes beyond the limits of professional responsibility*" (Sakellariou, 2015a, p. 464). Borrowing Sakellariou's (2015a) words: "*need trumps desire*" (p. 465).

We see this '*need vs desire*' theme as an overarching issue which the previously discussed themes (meaning of home, aesthetics, experience of ageing, and control and empowerment) can be integrated with. What is common to them is the underlying criticism of a usually hierarchised value system in home adaptation practices which prioritises needs for function or safety over others such as for dignity or control (Heywood, 2004b; Sakellariou, 2015a). Professionals, and people living with diseases/disabilities, have different views and understandings about said diseases/disabilities, environmental hazards, what adaptations would help, and what adaptations could make for a good (or better) life. The needs of older people in such cases are not solely related to functional independence or safety, although the latter might be a prerequisite for executing ADLs. Rather, they have much to do with people's lived experience about what their homes mean to them, what diseases, disabilities and inabilities mean to them, how they cope with them, and how these are transformed into their desires for a good (or better) life, as well as how they are conditioned by social capital, lifestyles or habits. Seen in this frame, it becomes explicit why we argued in the method section the importance of studies on functional and cognitive impairments, adaptive coping strategies taken, healthcare services (including but not limited to home adaptations) received, as well as on needs and costs of people experiencing ageing-related inabilities, disabilities, diseases and recoveries, or fall injuries and recoveries. They may help us to better understand people's varied needs and desires in adaptations. Some recent reviews are Abdi et al.'s (2019) scoping review of the care and support needs of older people, and van Leeuwen et al.'s (2019) review of the quality of life for older people, to name but a few.

Yet the emphasis on desires arguably runs up against a welfare approach to allocate rationed or scarce resources where needs also generally trump desires. Johansson's (2013) study was the only one that placed the discussion on needs in the welfare discourse, and explored how Swedish people prioritised a moral value according to which individuals should fulfil their obligations to others and should not cause unnecessary costs so that a good society is achieved. We agree with Heywood (2004b) who suggested not becoming trapped into the welfare approach to need when talking about the quality of adaptations, but there is an interesting question to be asked about how desires should be best incorporated within such rationing mechanisms. We also encourage future research to comparatively examine the welfare discourse in home adaptations in the UK and the Nordic countries.

^{*15} The needs vs desire debate lies at the centre of this 'Theories' section.

Drawing on Michel Foucault's work on biopolitics, and Annemarie Mol's critique of the 'logic of choice' in the context of healthcare respectively, Sakellariou (2015a,b) also discussed how professionals acted as representatives of a broader system of power and knowledge dominating the enactment of needs and desires, and how they acted as gatekeepers denying people's choice. These issues may be inextricably linked to the narrow application of 'criteria' and 'policy' in practice. However, we did not find relevant studies in the literature.

Finally, the woman paying for her own adaptations is another issue that deserves further attention. Aplin et al. (2013) also found people were laying out extra money on adaptations to facilitate their engagement with valued social, leisure and other activities over and above the functional activities considered by the adaptation services; some paid significant extra expense to have less hospital-like or 'disabled-looking' adaptations. For people who could draw upon other means or resources after their desires were turned down, they could still enact their desire. They could use their knowledge or social network, as well as monetary capital, to access information and expertise to get what they wanted. However, for those who live on a low income or minimum pension or who lack social connections, to do this (i.e. self-funding their adaptations) would not be possible. They would therefore have to accept what is given, compromising desires to needs. As such, failure to consider people's desire and align it with their social status could become a driving force of health inequality where, borrowing the phrases in Centre for Policy on Ageing (2009), 'well-meaning patronage' turns into 'unambiguous vilification'. Future research could examine the divide between public-funded adaptations users and self-funded adaptations users for more evidence.

3.2.2. Practice

Delays

In Sakellariou's (2015a) study mentioned above, the couple not only but also had to be subject to the disruptions to their lives resulting from 'delays' in their adaptations.

"While they waited for the lift to be installed, Dave had to remain on the ground floor of their house, with their downstairs dining room functioning as their bedroom [...] and [...] strip wash in the kitchen for several months".
(Sakellariou, 2015a, pp. 460, 462)

Similar stories of disruptions caused by delays in adaptation services were seen in many other studies too, although the issue of delays was neither the focus of Sakellariou's (2015a) study, nor those others'.

The cost of delays in home adaptations could be more than simply one of temporary disruptions to the clients' lives. In an intervention study carried out in Sweden, Petersson et al. (2009) found people reported increased difficulties in performing everyday life tasks for each consecutive month while they were waiting for their home adaptations due to the progression of their disability or disease, and long waiting time (a year) might eradicate the expected beneficial effects of adaptations in terms of reducing the difficulties.

Delays in home adaptation services in the UK have emerged as a predominant focus in the literature. Criticisms were widely seen in both academic studies and government- and third sector-led research reports. A series of recently published studies from Zhou and her co-authors (Zhou et al., 2019,2020a; Zhou et al., 2020b) provided a

comprehensive and insightful discussion of the issue. Using data collected from 112 local councils across three nations in the UK (England, Scotland and Wales), Zhou et al. (2019) revealed the extremely long average waiting time taken from the initial application for an adaptation to its completion which people commonly experienced throughout the country (up to 193 days and more [data collection was carried out in 2015]). Such a long waiting time would be long enough to eradicate the expected beneficial effects of adaptation, as suggested in Petersson et al.'s (2009) research. The figure would become even more intimidating when set against this observation from Wiseman et al.'s (2021) study: *"[an] average 23 day wait till installation of the home modifications [...] such a long interval [...] may result in a fall that leads to decreased physical functioning, requiring more extensive modifications or [entailing] loss of independence"* (p. 3). This is to say nothing of the disruptions to life that people have to be subject to. There are also hidden psychological consequences, since waiting time might be experienced as lasting longer than literally for older people who view the period through a quite different time lens than perhaps working-age people do. The population of older people paying for their own adaptations to avoid the long wait, as observed in Bailey et al.'s (2018) report, must be quantitatively significant.

Zhou et al.'s (2019) study also identified several underlying causes of such delays (see also Zhou et al., 2020a; Zhou et al., 2020b) as summarised below.

- a. Poor publicity of available information about adaptation grants and services.
- b. Limited resources – This includes financial constraints and the shortage of occupational therapists (OTs) to keep up with the high demand.
- c. Ineffective partnership – The provision of home adaptations in the UK involves multiple partner organisations which share fragmented responsibilities. They often work in silos and lack effective communication and coordination.
- d. Complex bureaucratic procedures – Some legal procedures put up institutional barriers against the provision of adaptations and result in extensions of the processing time. This is particularly the case for applications made by clients living in the private rented sector (PRS), and for applications that involve changing the structure of the building. The former require the landlord's permission whilst the latter need to get planning permission. Going through these legal procedures is the main cause of delays at the installation stage.
- e. Funding gap between grant and cost – Sometimes, delays occur when applicants have to spend time securing additional funding to cover the difference between the amount of grants they receive from local authorities and the total cost of their adaptations. This was found to be a key reason behind people dropping out of the adaptation process in England (Mackintosh et al., 2018).
- f. Lack of skilled contractors available to do the work.
- g. Client decision – Clients decide when to start the building work. This 'decision-making' process often takes weeks or even months. In addition, withholding or withdrawal may sometimes happen.

There are no easy solutions to any of these barriers. The poor publicity of available information, for instance, is a long-standing problem identified nearly two decades ago (see Awang, 2002) which has shown little subsequent improvement. Some local authorities moved or seconded occupational therapy services from the social care department into the housing department in order to improve coordination across sectors. However, occupational therapists in these new posts were found to be facing additional challenges, in particular the hurdle of learning the culture, language and skills to fulfill the remit in the housing service – which is different from that which obtains in

social care sectors (collective housing provision vs. individual need focus) (Grisbrooke & Scott, 2009). When it comes to the housing vulnerability for PRS tenants, not only do they have to go through bureaucratic procedures, there were also cases in which private landlords did not comply with their responsibilities and refused to give permissions (Zhou et al., 2019), as well as cases where tenants themselves felt they were not entitled to propose changes. As Damme and Ray-Degges (2016) quoted from one of their research participants: “[w]e rent this place so we can’t change a lot” (p. 99).

Nevertheless, inspiring ideas or initiatives taken by some local authorities were identified which could serve as solutions, as seen in the grey literature. Among these is the recent “Adaptations Without Delay” (The Guide) set out by the Royal College of Occupational Therapy (RCOT, 2019), which introduces a novel ‘framework’ for considering how adaptations can be delivered without delay. The most innovative idea of the framework was to define adaptations based on the complexity of the client’s housing, health and care needs (i.e. simple, moderate, or complex), rather than on its cost and scale (i.e. minor vs major). Viewed within this framework, a simple grab bar may be the solution to a complex situation, while a shower adaptation can be a solution to a simple issue. Clients would thus receive proportionate and timely responses and correspondent levels of intervention (universal, targeted, and specialist – for detailed explanation see the Royal College of Occupational Therapy [RCOT], 2019). The Guide also details workforce and operational considerations required for the different levels of intervention (RCOT, 2019). Another inspiring example mentioned in Adams & Hodges’s (2018) report “Adapting for ageing: Good practice and innovation in home adaptations” is that some local authorities introduced non-means-tested, fast-track grants for adaptations under a certain value (£5,000 - £8,000) and/or of particular types (e.g. stairlifts, bathing) as an alternative to the DFG. There was also a management change applied by Bristol City Council presented in Mackintosh’s (2012) report. A key feature of the redesigned service was appointing a single manager and assembling an integrated team of OTs, caseworkers, surveyors and technicians at the point of first enquiry (see Mackintosh, 2012 for details of the whole process).

Those barriers causing delays are not unique to the UK. Many of them have been identified as key challenges to the delivery of home adaptation services in other countries as well. The title of Alonso-López’s (2020) paper – “Filling the Gaps of Housing Adaptation in Spain: Is Private Expenditure an Alternative to Public Support?” – is a perfect reflection/exemplification of the gap between the limited provision of home adaptation grants and the high level of need. The Australian government’s reform of its home adaptation services – the embracing of a consumer-oriented and market-driven approach – is a strong action that was taken in recognition of the complexity and ineffectiveness of the old system (Aplin et al., 2020), although little evidence is available about whether such a market-driven approach outperforms the welfare approach.

Elective delays

So far, we have been discussing adaptations in a way as if adapting the home environment is a natural decision for older people who are experiencing declining functional capabilities and/or increasing risks. In fact, papers about home adaptation, regardless of their aims and objectives or focuses, usually start with one or two paragraphs asserting the significance of having appropriate adaptations to older people’s independence, safety, and, in a broader sense, health and healthy ageing, as evidenced in many empirical studies (see the outcome Section). There is also extant evidence suggesting a positive association of the likelihood of having home adaptations among older people with their perceived difficulties of ADLs (Johansson et al., 2007), with fall history or major health events (Gell et al., 2020), or simply with becoming very old (Harvey et al., 2014). While such causal relationships are yet to be proved, research also shows that it is quite common for people to electively ‘delay’ the time of adapting their home environments until they reach a point of crisis (Ekstam et al., 2016; Kruse et al., 2010). For example, Ekstam et al. (2016) found that while striving to have control over their lives, older people are more likely to turn to families and/or friends for help, seek other technical solutions, or think about moving than to consider adapting their home environments. In Kruse et al.’s (2010) study, older adults were reluctant to discuss risk factors identified in their residences, and expressed unwillingness to adapt their homes, even just small changes. In some cases, it was reported that people remained reluctant to alter their home environment despite experiencing falls (Cumming et al., 2001). This raises a host of questions: what deters people from having adaptations; do they really welcome such ‘well-meaning patronage’; what do these mean for the design and delivery of home adaptations as a healthcare service?

Researchers identified various psychological factors that could play a vital role in the decision-making when functional decline did not dictate an immediate reaction to the need for adaptations (see Ahn & Hegde, 2011; Kruse et al., 2010; Tural, Lu & Gole, 2020; Yuen & Carter, 2006). One extensively reported concern was age-related stigmatisations associated with home adaptations.

Bailey et al.'s (2019) study provides a deep insight into this issue by bringing the concept of 'ageism' to our attention. 'Ageism' refers to a set of prejudicial/discriminatory beliefs, attitudes, and practices towards older people, old age, and the ageing process perpetuated through stereotyping (Butler, 1969; cited in Bailey et al., 2019). In their paper, this is reflected in the association of adaptations with "*a fear and denigration of the ageing process, and stereotyping presumptions regarding competence and the need for protection*" (Bytheway & Johnson, 1990, p. 37). As Bailey et al. (2019)¹⁶ observed, people were reluctant to have adaptations, because they might view the clinical appearance of adaptations as a sign of age, incapacity, and frailty, and the altered appearance of homes resultant from adaptations as constituting aesthetically unpleasing changes (e.g. hospital-like) that signal the loss of life quality. A fatalistic attitude was also commonly seen, with people expressing the view that they had no option but to accept the changes as part of becoming old, falling ill or losing mobility.

Bailey et al. (2019) called for the age-related stereotyping barriers to home adaptations to be considered and addressed, alongside celebrating adaptations' evidencing positive outcomes. Moreover, they also mentioned the 'legacy of historical ageism' in the UK identified in the 2009 review of ageism and age discrimination in social care¹⁷ (Bailey et al., 2019). An echo of the "*low level of expectation by older people of what they will receive from services[,] and providers of services'*]limited views of what is acceptable to older people in terms of quality and choice compared to the population as a whole" in the report can be found in one of their research participants' statements – "*You know, you've got to forget about sort of the look of things and think what benefits it's given you, you know*" – which alerts the reader to the sustained age-related stigmatisation across ten years (Bailey et al., 2019, p. 11). Seen in this frame, age-related stigmatisations and stereotypes of home adaptations should not only be understood as internalised 'ageist attitudes' held by individual clients only, but rather as a socially ingrained and thus shared experience among professionals. For example, there could be a fatalist attitude among practitioners that 'quality and choice' are not possible within their agencies and therefore they have accepted this and developed a rationale that fits with it. Hence, it would be useful for future studies to examine how professionals' 'ageist attitudes' towards the clients might have been responsible for additional bias in the provision of home adaptations.

Signs of 'ageist attitudes' and other negative attitudes like ablism toward home adaptations were also seen in those writings about adaptations and the meaning of home. For example, Tanner et al. (2008) presented an older person's concern about the implications of designing for wheelchair accessibility: "*when the ramp was finished, this workman with a really loud voice called out 'this is now a disability house!' really loudly—the whole street would have heard*" (p. 206). Heywood (2005) quoted from one of their research participants to demonstrate how acknowledging the need for adaptations could threaten older people's self-image, which deters them from going ahead with the work: "*the lifts would be a constant reminder of the client's disability*" (p. 542).

¹⁶ See also the report produced by the same research team – Bailey et al., 2018, or its lighter version – Hodgson et al., 2018.

¹⁷ The review, entitled "Ageism and Age Discrimination in Social Care in the United Kingdom, A Review from the Literature" was carried out in 2009 by the Centre for Policy on Ageing commissioned by the Department of Health. Its purpose was to understand whether older people in the UK were discriminated against in favour of younger users of social care services.

3.3. The outcome dimension of home adaptations

This third section concerns the outcome dimension of home adaptations in the CPO model.

3.3.1. Improvements of function and safety

Examining clients' functional performance and safety after adaptations has been a primary focus in the literature, as well as a tradition of occupational therapy. Functional performance and safety were usually measured via self-rated independence, safety and difficulties in performing ADLs and/or I-ADLs, accessibility and/or usability of the home, as well as fall-related outcomes (actual falls and/or fear of falling).

Extant statistical evidence was found in intervention studies (e.g. randomised controlled trials [RCTs]) indicating that people who adapted their home environments were more likely to experience fewer difficulties in performing ADLs targeted by the adaptations than those in the comparison group (who did not) (Liu & Lapane, 2009; Petersson et al., 2009; Petersson et al., 2008; Whitehead et al., 2018). They were also likelier to perceive performing ADLs as safer especially ADLs related to self-care in the bathroom and getting in and out of the home (Petersson et al., 2008), although their self-rated functional dependence did not demonstrate significant improvement (Fänge & Iwarsson, 2005b; Petersson et al., 2008). There was also strong evidence observed in longitudinal studies that adaptations are effective in reducing bathing dependence and improving housing accessibility and usability (Fänge & Iwarsson, 2005a,b).

In terms of fall-related outcomes, inconsistent findings were found. For example, Crowell and Sokas (2020) found minor adaptations such as bathtub railings, stair railings, and chair lifts significantly reduced fear of falling (confidence in performing ADLs without falling) and annualised rate of falls, using a sample of low-income elderly and disabled community-dwelling individuals in the District of Columbia in Washington D. C. who were offered adaptations through a *Safe at Home* programme aiming at fall prevention by the District of Columbia Office on Aging in 2016¹⁸. In contrast, Carlsson et al. (2017) saw an increase in the number of their research participants reporting actual falls over time (up to 3 to 6 months) after receiving home adaptations. The inconsistent findings of falls reduction after adaptations were also observed in Lord, Menzi and Sherrington's (2006) review of early publications on the topic.

There are several plausible explanations for this inconsistency. First, home adaptations on their own were not effective. As Carlsson et al. (2017) suggested, they should be complemented with other interventions if the goal is to improve fall-related outcomes. In fact, interventions that include the mixed-use of exercise programme, training, assistive technology and home adaptations demonstrated the strongest evidence of preventing falls (see Chase et al. 2012). Second, the number/rate of falls might not be a reliable indicator of the effectiveness of home adaptations in preventing falls: an alternative would be to look at 'injuries caused by falls that needed medical treatment' or 'falls resulting in emergency admissions' instead of falls *per se*. Keall et al. (2015) in an RCT study of households from the Taranaki region of New Zealand, found a significant decline in annualised rate of fall-related injuries after minor adaptations had been made (e.g. grab rails for bathrooms and toilets; outside lighting; slip-resistant edging for outside steps, etc). The research sampled people from all age groups but included a large proportion of older people (40% were over 60 years old) (Keall et al., 2015, p. 233). The findings therefore might be tenable when sampling older people only. Moreover, the promising effect of minor adaptations on reducing fall injuries was also evident in the research team's most recent RCT study focusing on households with Māori occupants in New Zealand (Keall et al., 2021). Third, and common to all intervention or evaluation studies, home adaptations involved heterogeneous components.

¹⁸ Notably, Crowell and Sokas's (2020) study was the first one that went beyond research protocol to evaluate a community service intervention program.

While quantitative evidence is providing us with a certain level of ‘confidence’ (defined as a statistical term) of expecting positive outcomes of home adaptations, some qualitative findings warn us how the reality can be more contingent, complex and personal. For example, Thordardottir et al. (2019) found some of their research participants continued to have difficulties in performing specific ADLs despite having targeted adaptations in place as their functional capacity continually declined (Thordardottir et al., 2019). Moreover, on some occasions, clients’ capacity declined so rapidly that the need for an additional adaptation arose just after they received their initial one (Thordardottir et al., 2019). Some older people even saw home adaptations only as a temporarily delaying solution to their declining functions as further declines were inevitable (Bailey et al., 2018). In another study carried out in two local authorities in North East England, using data collected from wearable cameras in combination with semi-structured interviews, Wilson et al. (2019) revealed ‘inconsistent’ and ‘unintended’ use of adaptations among their research participants, in particular how they would try to do ‘things’ (e.g. ADLs) independently when they felt they could instead of relying on adaptations. Nevertheless, to present these findings is not to deny the effectiveness of adaptations in improving functional performance and safety of older adults. In fact, sustained positive experiences of safety in performing ADLs, usability of the home environment and reduced falls that adaptations could bring were also reported in numerous qualitative studies (Golding-Day & Whitehead, 2020; Bailey et al., 2018; Thordardottir et al., 2019; Whitehead & Golding-Day, 2019). Rather, it emphasises that home adaptations may not always be one-off, stand-alone interventions, but are situated within the everyday practice of life (Preece et al., 2021).

3.3.2. Health gains

Unlike function and safety, health is never a clearly defined term, nor could it be transformed to a readily measurable variable.

A report from Heywood (2001) provided the most straightforward evidence of health gains, in which participants were asked whether the minor adaptations they had had affected their health with the options ‘no effect’, ‘good effect’, and ‘bad effect’. The results revealed positive health outcomes of adaptations with 77% respondents selecting ‘good effect’ (Heywood, 2001). Yet, the concept of ‘health’ if defined from a theoretical position can be much more complicated: health could be defined as narrow and clinical, as ‘absence of disease’ (Doyal & Gough, 1991, p. 56, cited in Heywood, 2004a, p. 130), or as vague and broad yet also more meaningful as ‘wellbeing’. Here, it was Heywood’s (2004a) study again that gave the only available – yet most revealing – discussion of the health impacts of home adaptations. In the study, Heywood defined health as a concept closer to wellbeing, and then presented three key types of health gains which a well-designed adaptation could bring to the clients: relief of pain, preventing accidents and reducing fear of accidents, and ending depression. More specifically, Heywood (2004a) found a stair-lift made a dramatic difference in relieving pain for people with conditions such as angina, emphysema, or musculoskeletal problems; adapted toilets and bathrooms lifted people from painful experience of humiliation and embarrassment; and widened doors, and ramps and extensions restored to people access to their gardens and/or the outside world for fresh air and/or socialising.

The literature review section of this study is equally revealing too. In the review, Heywood (2004a) provided an overview of the wide range of themes that are important or relevant to understanding the health impacts of adaptations scattered in the literature. These themes included the meaning of home, wellbeing and quality of life, psychological relationship with the home, adaptations as a civil right, empowerment, and even the rarely-discussed medical and therapeutic effects of taking a bath or shower, as all being of relevance. Seen in this frame, feeling safe, increasing confidence, regaining privacy, dignity and self-respect, conferred independence, and restoring of relationships with other family members after adaptations – all represent essential types of health gains. This is also true for increased participation in domestic life, as well as in social and civic life outside the home.

3.3.3. Economic benefits

Home adaptations also bring economic benefits through saving the monetary or laboury costs of health and social care.

Considering the reductions in the costs of home fall injuries after adaptations reported in Keall et al.'s (2017) study which was based on the same RCT that showed a reduction of fall-related injuries after adaptations (Keall et al., 2015, mentioned in Section 3.3.1). Arguably, it probably does not need an RCT study to prove home adaptations are economically beneficial, because the reduction of fall-related injuries after adaptations would naturally lead to reductions in the relevant cost. Yet, in the same study, Keall et al. (2017) provided evidence that there was a significant increase (60%) of *benefit-cost ratio* for people with a prior history of fall injury, which corroborated and added to a similar early finding from Salkeld et al. (2000) that home adaptations were most likely to be most *cost-effective* amongst older people who have a history of falls. This finding is interesting because it raises an interesting question – when would be the suitable time to bring in home adaptations?

Sometimes, evidence of economic benefits of home adaptations was more latent. Carnemolla and Bridge (2019), for example, found home adaptations had significantly reduced the *hours* of care spent weekly in the homes of community-dwelling older adults in Australia, predominantly the hours of informal care. Hollinghurst et al. (2020, 2021) examined whether home adaptations could reduce the risk of *care home admissions* and *emergency fall admissions*. Using linked longitudinal administrative data comprising older adults aged over 60 who were registered with a GP in Wales between 2010 and 2017, they found that the risk of care home admissions for moderately and severely older adults reduced significantly over 1-, 3- and 5-year time periods after being provided with adaptations by Care & Repair Cymru, while the risk for fit and mildly frail individuals kept increasing (Hollinghurst et al., 2020, and the likelihood of having emergency fall admissions also decreased after adaptations (Hollinghurst et al., 2021). These findings all suggest that investing in home adaptations is a good use of scarce public funds in the health and care industry.

While these findings are promising, we should not underestimate the staff demand and cost involved in adaptation services. Curtis and Beecham (2018) examined the costs for materials and labour in organising, supplying and fitting a commonly requested major or minor adaptation in England (UK) through its DFG scheme, using survey data collected across 20 local authorities and Home Improvement Agencies in England in 2014-2015. Their study revealed considerable staff cost involved in the provision of home adaptations, absorbing up to 24% of the total mean cost per major adaptation (£16,647) and 76% per minor adaptation (£451) (Curtis & Beecham, 2018). In the New Zealand RCT study, Keall et al. (2015) also reported substantive costs of labour in adaptation provisions in the New Zealand context which accounted for 37% of the overall average cost (including costs of labour, transport, and material) per minor adaptation (NZ\$560, equivalent to £290).

Some researchers set out to examine the cost-effectiveness of adaptation services. Zhang and Zhou (2020) proposed a four-dimensional framework to comparatively evaluate different government-funded adaptations schemes, considering their performances in 'efficiency', 'effectiveness', 'equality', and 'ethics' – some commonly examined aspects within health economics. They then specifically compared the input efficiency (measured by monetary and time costs) and the output effectiveness (measured by clients' satisfaction) of two government-funded adaptations schemes in Wales (UK), the Physical Adaptations Grant (PAG) and the DFG scheme, using data collected across 9 local authorities (Zhang & Zhou, 2020). Their study found PAG outperformed DFG in terms of both efficiency and effectiveness due to social housing landlords' higher level of motivation to minimise the cost (Zhang & Zhou, 2020). Noticeably, PAG is a funding scheme provided directly to registered social landlords to adapt homes for their disabled or older tenants rather than to tenants themselves. Zhang and Zhou's (2020) finding thus suggested that the adaptations scheme provision to social landlords (i.e. the PAG) was more cost-beneficial than that provided to owner-occupiers and private tenants (the DFG).

4. Conclusion

4.1. Summary

This evidence review was constructed around three principal areas of enquiry: 1) Who need home adaptations?; 2) How are home adaptations placed and what works or would work as examples of good practices?; and 3) What are the outcomes of home adaptations? Our intention was to identify areas for future research to consider, while offering policy implications for the improvement of adaptation services in Scotland and across the UK.

Following an established methodology for systematic evidence review that has been applied in many of CaCHE's previous reviews, we identified 76 primary studies published after 2000 from the academic literature which form a rich and diverse evidence base. Themes that emerged from the readings were then organised into a three-dimensional framework (client, process and outcome) in line with the three principal areas of enquiry.

The client dimension reviewed a couple of ways in which the characteristics of home adaptation applicants/users had been explored in current literature. Some are quite revealing and clearly demonstrate the importance of increasing our knowledge about the characteristics of adaptations clients, such as the investigation of ethnic disparities in the use of adaptations (e.g. Bakk et al., 2017) which further draws our attention to wider issues of inequality in housing and the health and social care system. Some, we would argue, might be an oversimplification, the interpretation of which one must be cautious about in practice. One example is those studies which associated the use of adaptations with types of disease (e.g. Welte et al., 2020). That might be an oversimplification because home adaptations happen in patients' home environments where some types of disease are addressed in different ways from hospital or clinic settings (for an insightful discussion with regard to this point see Sakellariou, 2015b). At the end of the section, we also discussed the need for paying further attention to cohabitants.

In the process dimension, we tried to distinguish theory and practice. The Theories section recognised the growing emphasis on considering clients' *desires* beyond function and safety *needs* in pursuit of a person-centred approach to the design of adaptations for 'effective' and 'beneficial' outcomes (in contrast to wasteful and harmful), from early emphases on considering the meaning of home (Heywood, 2005; Tanner et al., 2008) to more recent calls for understanding the experience of ageing (Renaut et al., 2015) and adaptive coping strategy (Kim, 2021). The Practice section focused on the frequently reported delays during adaptation services in the UK and what we called 'elective delays' that resulted from stigmatisations associated with home adaptations. We realised we have used much more spaces on discussing the challenges, barriers and criticisms associated with home adaptations than on reporting successful cases – i.e. positively experienced/rated adaptations which could be equally revealing.

We organised evidence about the outcomes of adaptations into three broad categories: functional performance and safety, health gains, and economic benefits. While improvements of functional performance and safety as the primary focus of adaptations studies have been documented in greater depth following RCT studies, health gains and economic benefits were relatively weakly evidenced. For health gains, Heywood's (2004a) study remains the most (sometimes the sole) referred-to study, and economic benefit is an emerging topic in academic literature. Most papers were published after 2015.

The proposed CPO framework is the first attempt to systematically organise the fragmented literature of home adaptations. It thus serves as a portrait of home adaptations research to date. Topics, theories or issues which were often seen as complex and separate become more coherent and accessible (Figure 1). More importantly, it is an open structure into which future growth in knowledge can be readily integrated. There is also a place for discussions on policy to be incorporated into it in the future. The framework also reveals interaction between the proposed dimensions. For example, people's social status can shape their ageing experiences which further would affect their needs.

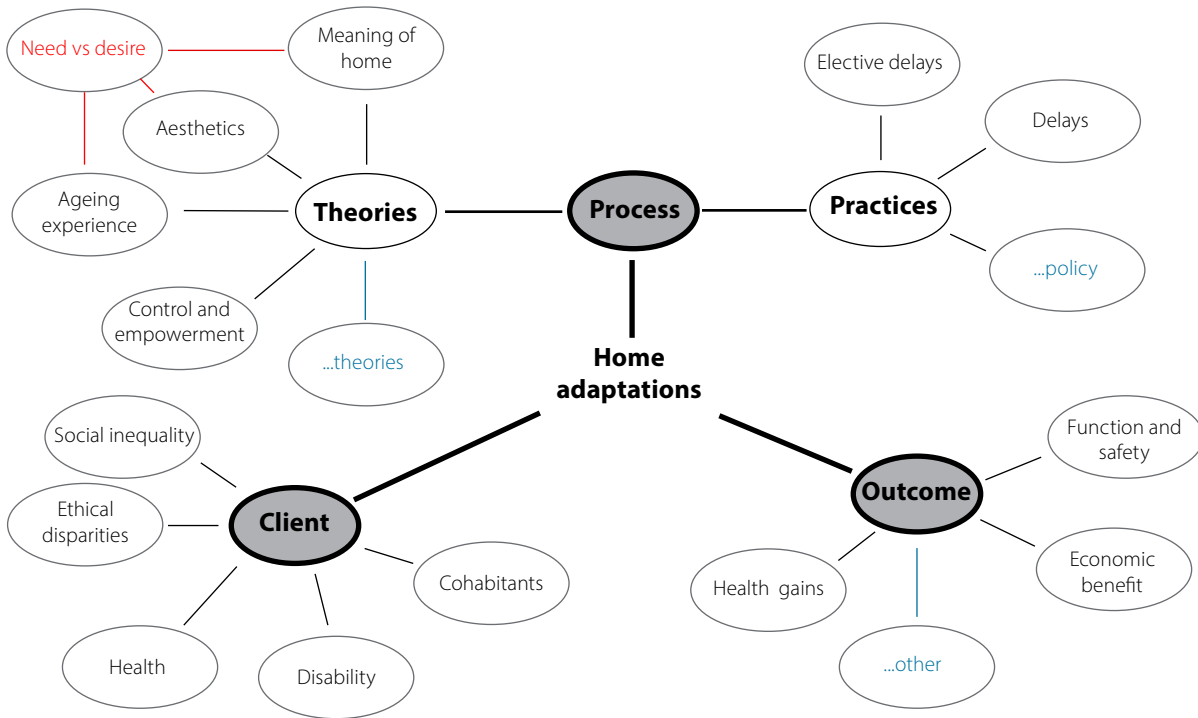


Figure 1. The Client-Process-Outcome Framework

We did not systematically engage with the classical theories underpinning home adaptations studies, such as the widely referenced person-environment fit model in environmental gerontology, which indeed would require much more space than this review could permit. Nevertheless, we still identified a few inspiring theoretical perspectives that researchers have applied to their studies, such as Michel Foucault’s ‘biopolitics’ (in Sakellariou, 2015a), Annemarie Mol’s criticism of ‘choice’ in health care (in Sakellariou, 2015b), Malcolm Cutchin’s ‘place integration’ (in Johansson et al., 2009), Stephen Golant’s theoretical model for adaptive coping strategy in late life (in Kim, 2021), etc.

We did not include policy papers either as they are beyond our primary enquiry and more the focus of the sister paper by Dr Vikki McCall. However, we would like to briefly mention two such papers. One is Mackintosh (2020) which claimed the urgency of providing a solid evidence base of the impacts of adaptations on people’s health and economic benefits to health and social care with a view to future reform. The other is Mackintosh and Heywood (2015) which revealed the need for a clear policy and budget for adaptations for disabled housing association tenants.

4.2. Actions for the future

This review identified several fundamental knowledge gaps in the current evidence that we think are important and appealing to consider when thinking about areas for future research.

1. There has been limited empirical evidence on social inequality and intersectionality in home adaptations in the literature. Meucci et al.'s (2016) study was the only one we found that looked into this theme in adaptations. Older people's experience of ageing, their needs and desires, adaptive responses, and the sources of information and care they can access to meet their needs and desires are conditioned by class-specific factors such as social capital. Quoting Renaut et al. (2015) again: "*the way growing old was experienced by a retired doctor living in a comfortable apartment in a well-off district of Paris was not the same as that witnessed by the partner of a former miner living in a declining provincial town in northern France*" (pp. 1288-1289). Furthermore, there is a long-standing concern over the disproportionate benefit from public services 'enjoyed' by affluent 'middle-class' social groups (Hastings, 2009; Hastings & Matthews, 2015). There may also be a 'postcode lottery' in the quality of adaptation provision. With the discussion of 'social class' firmly being back in the public eye in the new century (Savage et al., 2015), social inequality is a rich field of future research in adaptations. In fact, the topic of social inclusion has been widely discussed in the ageing literature.

The need for exploring social inequality and intersectionality becomes more pressing with the knowledge that some older people can afford to pay extra costs to have less institutional-looking adaptations (Aplin et al., 2013) while others may have to simply accept what is given; some can draw upon other levers such as information and monetary resources, even if their needs are denied (Sakellariou, 2015b), while others still may feel disempowered or helpless. Therefore, one perspective to explore how social inequality might affect adaptations is to look at self-funded adaptations and public-funded adaptations comparatively. This approach also avoids treating older and disabled people as a homogenous group and encourages the client-centred approaches that are noted as essential for adaptations delivery in the literature.

2. The significance of considering cohabitants' views in adaptations was frequently argued, but less explored.
3. The PRS tenant group remains underexplored compared to other housing tenures in research on adaptations. There is thin evidence on the ways in which the housing vulnerability of older people living in PRS affects their access and rights to home adaptations in achieving wellbeing. Given PRS is a growing sector that houses an increasing number of older people who might also live in poverty, it is vital that the PRS is not neglected in policy debates on adaptations and healthcare. We strongly encourage further research on this critical dimension.
4. The absence of appropriate approaches for the assessment of clients' concerns about aesthetics (Struckmeyer et al., 2021a) is striking, since studies has already revealed that a hospital-looking adaptation could invoke feelings of institutionalisation as well as disability- and ageing-related stigmas and hence affect health and wellbeing. This is an interesting theme to develop. One idea may be to consider how much aesthetics is valued by clients using economic valuation methods such as contingent valuation, given the fact that people may pay more to have less hospital-like or disabled-looking adaptations (Aplin et al., 2013).
5. Placing the discussion of quality of adaptations within the welfare approach to meeting need does create dissonance with our emphasis on prioritising an understanding of people's desires, because the emphasis in policy thinking within the welfare discourse will be upon how we might best distribute insufficient resources in a manner that appears just. In such circumstances, comparing needs and controlling the demand for public benefits trump the understanding of desires. However, Johansson's (2013) study in the Swedish context did reveal how the welfare tradition had influenced clients' and professionals' moral reasoning when applying for adaptations. There is thus a need to understand how people (clients and professionals) experience and react to the difficulties of rationing resource-allocations in adaptation services. As far as we are aware, this is, as yet, an under-explored theme.

6. The health gains from adaptations is another under-explored area due to the conceptual difficulties of isolating causal health outcomes. Heywood's (2014a) call for "*set[ting] up some much more precise hypotheses concerning adaptations and health, and set[ting] out to test them*" (p. 141) has not been taken up by other researchers. However, it matters as much as functional and safety outcomes when we look towards developing adaptation services. Existing evidence relating to health gains relating to adaptations is clear. No one is really denying the importance of those benefits which adaptations bring. The challenges are actually mostly in their delivery and implementation – for example, the delays that make adaptations less effective.

These knowledge gaps in the literature have fuelled our concerns regarding gaps in services related to social inequality, the experience of adaptations in the PRS, aesthetics, the cumulative effects of austerity (and/or gatekeeping) and the lack of information about health outcomes. By starting to fill these evidence gaps, we might be in a better position to tell whether there are indeed such gaps in service provision that need to be addressed.

In the meantime, we have also generated a few thoughts which might be useful for policymakers and practitioners in Scotland to consider. Some have been suggested in previous studies but are worth reproducing here.

1. Promoting a renewed understanding of the concept of home adaptations among professionals that recognises the dynamic needs of people, which varies as their ageing experience varies, which diversifies as their home experience diversifies, and which changes as their health needs change.
2. Providing more social support as well as legislative protection for older people living in PRS, and possibly considering offering alternative funding schemes – such as providing direct funding to PRS landlords like the Physical Adaptations Grant scheme for social housing landlords – which may help to streamline the application process and reduce abuses that PRS tenants are subject to.
3. Considering organising independent home assessments. More ambitiously, such assessments can be integrated into the household survey and collected information can be added to the NHS health and social care database. In so doing, we might be able to develop a national-scale database for future research use and policy design.
4. Promoting client engagement. An open attitude on the professional side is recommended, whereby client expertise can be valued and their preferences listened to. This should be built into practice and could be supported with training. Meanwhile, we should also empower the client via providing good-quality and timely housing advice and social support services that can help people to identify, reflect on and self-manage their needs and options.
5. Arranging post-adaptation evaluations to assess their outcomes (in particular health gains) so that best practices could be identified. Such information could join the assessment database and be made accessible to all sectors involved in adaptations – housing, health and social care – to guide practices. The current satisfaction surveys on completion of adaptations mainly relate to service delivery, not the outcomes of adaptations (Mackintosh, 2020).
6. Last but not least, while we were finalising the draft of this review, the Centre for Ageing Better published its guide for combating everyday ageism and promoting people's confidence in talking about ageing and older age (Centre for Ageing Better, 2021b). As society is alarmed by the widespread and constant discrimination against people based on their age, it is a pressing issue for adaptation professionals and policymakers to be conscious of ageist behaviour.

4.3. Final Reflections

As stated at the beginning, we limited our focus on home adaptations to community-dwelling older people, but children and younger adults with diseases/disabilities also need adaptations. They might have different needs compared to older people. We therefore suggest conducting a separate review of any relevant literature in these sub-fields.

We should also be mindful of those who have learning difficulties, and be responsive to their specific needs. However, the body of literature relating to this topic is relatively small.

While we criticise delays, austerity and other institutional barriers to the effective delivery of adaptation services, it is necessary to be pragmatic in terms of making promises for future improvement. With growing demands and limited funding and staff, it might be worth exploring alternative pathways to adaptations such as through third-party payments like insurance outside the NHS, low interest loans or reverse mortgages. We might also want to consider the private market for home adaptations, given the clear evidence that people do often pay for their own adaptations. Nevertheless, opportunities within the existing system need to be explored first.

We narrowed our discussions on home adaptations as a single intervention, but we do wish in the future that adaptations could be provided as an integrated part of a multifaceted intervention package. As we have seen at least in some fall-related studies, multifaceted interventions demonstrated better results.

Finally, we need to extend our vision from providing quality adaptations to designing and building accessible housing for future generations. In a chat within the research team, we shared some personal stories about adaptations. One such story was that the parent of one researcher had used home adaptations in their later life, but when the house was sold after they passed away, the person who bought the house removed all the adaptations. This is a wider problem where an adapted home environment literally does not 'fit' with the young people who next occupy the house. Although it is challenging to prevent such things from happening, it furnishes one reason to embrace the idea of 'inclusive' or 'universal design' when providing new houses, and to think more creatively about the quality, re-use and re-cycling of adaptations within the existing housing stock.

5. References

PLEASE NOTE: Items marked (**) are those 76 academic papers (both cited in this review or not) that made up the *core evidence base* compiled with the review methodology. Items marked (##) are the additional articles. The remaining items were sources cited to contextualise the subject matter, including reports in the grey literature, existing review papers (listed in Appendix 1), and assessment tools (listed in Appendix 2).

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Appendix 1: A list of relevant review papers in the literature

Title	Source
Home modification assessments for accessibility and aesthetics: A rapid review	Struckmeyer et al., 2021
Effects of environmental modification on activities of daily living, social participation and quality of life in the older adults: a meta-analysis of randomized controlled trials	Lim et al., 2020
A scoping review of home modification interventions—Mapping the evidence base	Carnemolla & Bridge, 2020[2018]
Effect of home modification interventions on participation of community-dwelling adults with health conditions: A systematic Review	Stark et al., 2017
Home modifications for people with Alzheimer’s disease: A scoping review	Struckmeyer & Pickens, 2016
Systematic review of the effect of home modification and fall prevention programs on falls and the performance of community-dwelling older adults	Chase et al., 2012
The home environment and disability-related outcomes in ageing individuals: What is the empirical evidence?	Wahl et al., 2009
Falls and the physical environment: A review and a new multifactorial falls-risk conceptual framework	Feldman & Chaudhury, 2008
Home environment risk factors for falls in older people and the efficacy of home modifications	Lord, Menzi, & Sherrington, 2006
Intervention strategies and risk-factor modification for falls prevention - A review of recent intervention studies	Cumming, 2002

Appendix 2: A list of assessment tools

Name	Source
Home Safety Self-Assessment Tool (HSSAT)	Horowitz, Nochajski & Schweitzer, 2013
HoPE	Rousseau et al., 2013
In-Home Occupational Performance Evaluation (I-HOPE)	Stark, Somerville & Morris, 2010
Housing Enabler Screening Tool	Carlsson et al., 2009
SAFER-HOME	Chiu & Oliver, 2006
Cougar Home Safety Assessment (CHSA)	Fisher, Coolbaugh & Rohes, 2006
HACE	Keysor, Jette & Haley, 2005
I-HoPE Assist	Keglovits, Somerville & Stark, 2005
Home Environmental Assessment Protocol (The HEAP)	Gitlin et al., 2002
Comprehensive Assessment and Solution Process for Aging Residents (CASPAR)	Sanford et al., 2002
Home Assessment Profile (HAP)	Chandler et al., 2001
Housing Enabler	Iwarsson, 1999