



## Evidence Based Research

### Identifying Barriers to Home

### Modifications

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#### Abstract

**Objectives:** To identify possible barriers and sources of resistance that people with an impairment of function often experience when they need to modify their home environments.

**Design:** Systematic review of electronic and other published literature.

**Main outcomes of the search:** The systematic review highlighted seven barriers commonly mentioned in the literature: financial problems, lack of knowledge, lack of social support, denial, concerns about stigma, concerns about desirability and/or aesthetics, and tenure. These seven barriers to home modifications can be clustered into two main categories: psychological and practical.

**Results:** Seventeen references pertaining to consumers' readiness to undertake home modifications were located and included in this systematic review. The majority of the research was conducted in the USA (70%), used qualitative research methodology (55%), and involved participants with physical and/or psychological disability (54%). Only one paper originated in Australia, and none investigated minorities residing in Australia. A few suggestions of improvements for available services and intervention programs are discussed in order to overcome the seven identified barriers.

**Conclusions:** The literature most commonly mentioned seven types of psychological (i.e., concern about stigma, lack of social support, perception of no need) or practical (i.e., cost, aesthetics/desirability, tenure, lack of knowledge) barriers to home modifications.. It is possible that the presence of psychological resistance to home modifications was due to the presence of psychological disorders among the investigated populations; 30% of papers included participants with a psychological disability. The data, however, were not reported in a way that would permit the conclusion that people with psychological disability were any more likely to report psychological resistance to home modification. The prevalence of psychological resistance highlights the need to improve consumer services and intervention programs to overcome the psychological barriers. Future research should aim to explore beneficial ways to enhance psychological assistance to potential home modification consumers, particularly if they are diagnosed with a psychological dysfunction.



## Acknowledgements

The Home and Community Care program, a joint Commonwealth and NSW Department of Ageing, Disability and Home Care (DADHC) program is gratefully acknowledged for providing funding to support the production of this document. The authors wish to thank Stephanie Mathews for reviewing, commenting and proofreading this document.

This review is based on recent research findings from Bridge and Phibbs (2007) report "Research into the Nature of the Need for Home Modification Products and Services in Queensland". The research was commissioned by the Private Housing Support Unit, Queensland Department of Housing.

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Bridge, C, Phibbs, P, Gohar, N. & Chaudhary, K. (2007). *Evidence Based Research Bulletin: Identifying barriers to home modifications*. Sydney: Home Modification Information Clearinghouse, University of Sydney. [www.homemods.info.au](http://www.homemods.info.au)

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## Problem statement

What barriers do people experience when they need to undertake home modifications?

## Area of concern

Identify barriers to home modification assistance services for people with an impairment of function and suggest ways to overcome those barriers.

## Background

Home modification is the specific redesign of living spaces for persons with disability or impairment of function. The domain of home modification practice specifically encompasses health, disability, and safety problems of older persons, persons with disabilities and their carers. Home modification is closely associated with the notion of home *renovation* or *remodelling*, but can be distinguished on the basis of scale and purpose. Modifications are typically less extensive than renovations or remodelling; while remodelling and renovation may be driven by lifestyle or activity (e.g., adding a rumpus room for growing children) or by aesthetics, modification is driven by the need to correct environmental deficits to permit occupants to perform activities of daily living.

The relationship between people and their dwellings and the objects within them is critical to their sense of safety, efficacy, and wellbeing (Burrige & Ormandy, 1993; Conway, 1995; Ineichen, 1993; Krieger & Higgins, 2002; Lowe, 2002; National Housing Federation, 1998; Smith & Alexander, 1997; Thomson, Petticrew, & Morrison, 2002; Wilkinson, 1999; Young & Mollins, 1996). Consumers, families, and healthcare professionals agree that appropriate consideration of physical environments can be a critical factor in reduction of institutionalisation and promotion of integration and inclusion (Iwarsson, Isacson, & Lanke, 1998)

Home modification service funders typically place the highest priority on functional outcomes, but failure to factor in meaning and personalisation can lead clients to reject interventions (Bridge, 1999; Clemson, Cusick, & Fozzard, 1999). Emotional relationships are not just limited to people, but include significant physical environments. For instance, homes fulfil many needs for their occupants: they provide a place of self-expression, a vessel of memories, and a place of refuge from the outside world. Attachment to physical objects and places usually begins in childhood (Marcus, 1995). Moreover, home is where human beings spend most of their time engaged in basic and essential activities such as eating, preparing food, sleeping, and socialising. Because of the emotional component of the person/home relationship, people may make decisions about their home that seem irrational.

## Theoretical Models to Explain Resistance

A number of health education theoretical models have been used to look at consumer information journeys in relation to explaining their readiness to act. One such model is the 'transtheoretical model' (Prochaska & Velicer, 1997) of health behaviour change. This model has been applied extensively in smoking, drug, and alcohol programs to readiness for action and to highlight information and strategy gaps. More recently it has also been applied to explain home modification product uptake (McNulty, Johnson, Poole, & Winkle, 2003). Within the model, five stages are hypothesised as distinguishable by differences in information need and/or action readiness over time.

- i) **Precontemplation** is the stage in which people do not intend to take action in the foreseeable future, which is usually defined as the next six months. People may be in this stage because they are not in the housing market (no hope of home ownership or secure



tenure) or because they are uninformed or under-informed about what is possible. This group needs information about possibilities; they need to appreciate what is possible and want it.

- ii) **Contemplation** is the stage in which people intend to change within the next six months. They are actively looking for information about possibilities, but are not yet ready to act. Most promotional material (e.g., The Queensland Housing Smart Home booklets, the Victorian Building Commissions Welcome Book, the MBA's Adaptable Home Book) is aimed at this group
- iii) **Preparation** is the stage in which people intend to take action in the immediate future, usually defined as the next month. They have typically taken some significant action during the past year. These individuals need to develop a plan of action and may begin such a plan by visiting places with information and products (e.g., Independent Living Centres, bathroom/kitchen showrooms, Home World, etc.)
- iv) **Action** is the stage in which people actively make choices. This is the point at which they purchase products, and they need information about technical specifications, legalities, warranties, and maintenance.
- v) **Maintenance** is the stage after people have implemented plans. For instance many products such as water tempering or control devices, smoke alarms, floor coatings, and timber need regular inspection and repair.

## Evidence Based Practice Search Methodology

A systematic review of literature was undertaken based on the Protocol Guidelines for Systematic Reviews of Home Modification Information to Inform Best Practice (Bridge & Phibbs, 2003). Specific search terms as identified in Table 1 were used to locate relevant materials on the databases available via the University of Sydney Library and the internet. Search terms included British and American terminology and spelling.

**Table 1: Search terms pertaining to the research question examined to search databases for relevant information**

Concept 1	Concept 2	Concept 3
Refusal	Home	Modification
<b>Keywords</b>	<b>Keywords</b>	<b>Keywords</b>
denial	home	alteration
objection	house	adaptation
opposition	dwelling	retrofit
disagreement	environmental	adaptation

Concept 1 Refusal	Concept 2 Home	Concept 3 Modification
<b>Keywords</b>	<b>Keywords</b>	<b>Keywords</b>
non-compliance	residen*(i.e. residential, residence)	modif** (i.e. modify, modification)
reluctance	household	safety
acceptance	abode	assistive technology
change	domicile	ramp (often used in plural)
self-image	habitation	grab* (i.e. bar, rod, rail) N.B.: with and without space.
perceptions	lodging (often used in plural)	design alteration
values	apartment	redesign
attitudes		renovat* (i.e. renovation, renovate)
aesthetics		
lifestyle		
cost		
economic constraints		
stigma		
fear		

## Inclusion criteria

References were selected if they were written in English, published from 1990 onwards and available via the University of Sydney Library or the internet. Additional materials were identified from the reference lists of relevant papers.

## Connectors

AND, NOT, OR, ADJ (adjacent).

## Transaction symbols

\*, \$, ?, # (dependent upon database search).



## Selection of databases

The terms contained in Table 1 were used to search the following sources: Ageline, APAIS (Health), ARCH( Australian Architecture) Ageline, AMED (Allied & Complementary Medicine), Cinahl (Nursing & Allied health), Family & Society, Health & Society, PsycINFO, PubMed, Web of Science and Google scholar.

## Exclusion Criteria

The review excluded materials that did not meet the inclusion criteria and textbooks, conference abstracts, unpublished conference papers, and theses. Publications available only through purchase also were excluded.

Figure 1 illustrates the stages at which review criteria were applied and materials were excluded.

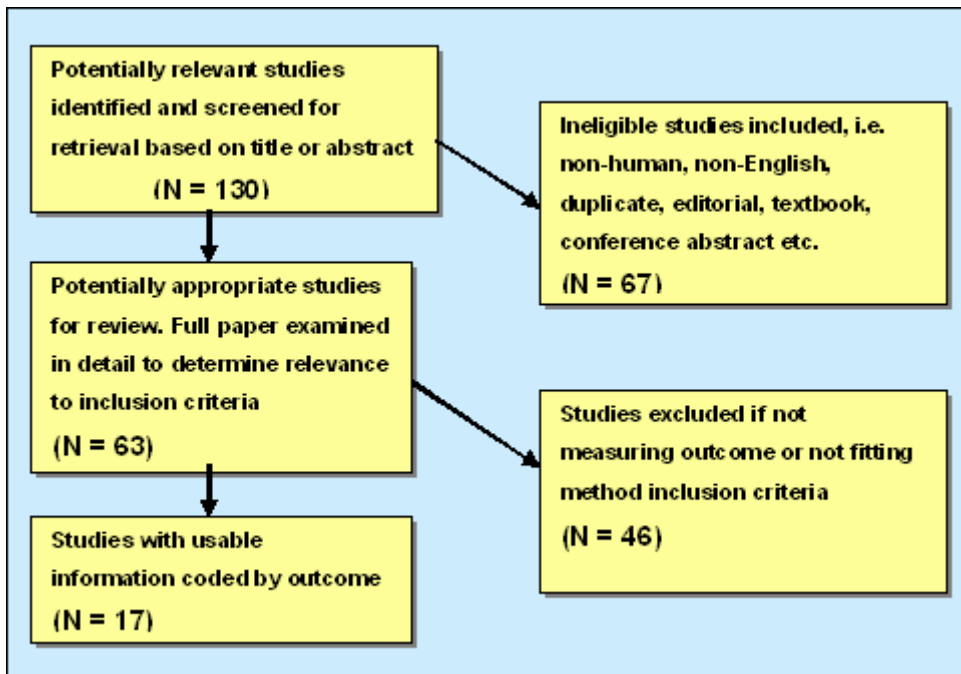


Figure 1: Process flow

## Outcomes of Search

The systematic search provided 130 references that referred to the appropriate search terms. After these references were examined in detail, only 17 publications were included for analysis and logged in the matrix (see Appendix 1). A full list of relevant references is in Appendix 2.

## Demographic variables

The demographic variables identified in this review (Figures 1-5) are consistent with those found by ABS (Disability and Carers Survey, 2003). According to the recent ABS findings, people with a need for home modifications tend to be older than 70, female, have a low SES, and live alone. In the 17 papers reviewed for this report, 59% of the papers involved participants over 70 years of age (see Figure 1); in 64% a majority of the participants were female (see Figure 2); and only 12% included a majority of participants with post-secondary education, suggesting a low SES (see Figure 3). While only 24% of papers reviewed reported that a majority of the participants lived alone, only 34% of reported that a majority of participants lived with a spouse or other relatives; the remaining 41% of the papers did not report participants' living arrangements (see Figure 4). The majority of papers did not target minority groups; 70% either did not specify race or the participants were primarily Caucasian (see Figure 5). Only 13% of the papers included Hispanic participants and 17% included African American participants; all of the papers specifying minority participants were produced in the USA; none of the papers reviewed investigated resistance to home modification by minority populations residing in Australia.

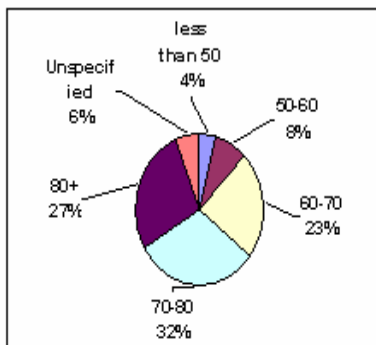


Figure 1: Age

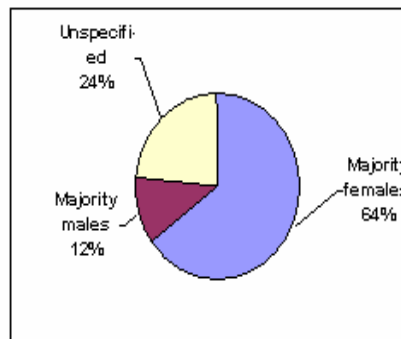


Figure 2: Gender

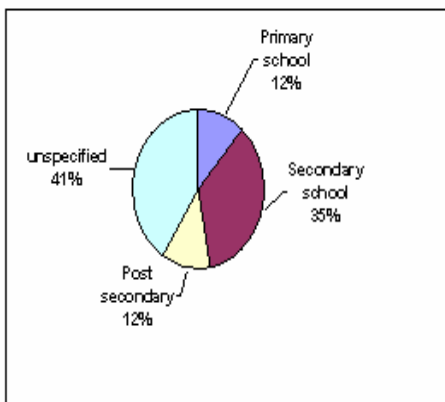


Figure 3: Education

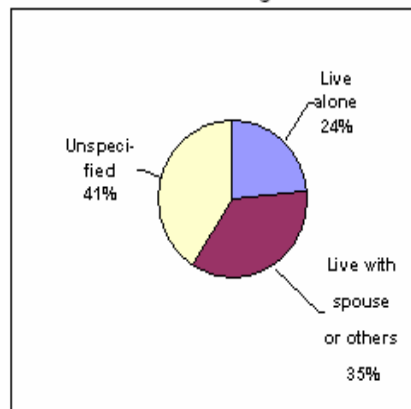


Figure 4: Living Arrangements

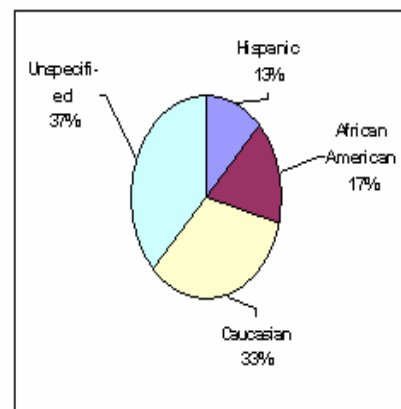


Figure 5: Race of Participants

Figures 1-5: Demographic variables



## Nationality of literature

As depicted in Figure 6, most of the papers examined as part of the systematic review were produced by researchers in three countries: USA (70%), UK (12%), and Australia (6%). Although most of the principles regarding resistance to home modifications identified in the USA may also be applicable to Australia, additional research is needed identify the possible barriers and resistance themes specifically associated with the Australian multicultural community. For example, the barriers and resistance to home modification of people who are indigent or who are members of particular cultural groups may be different from those of other communities within Australia.

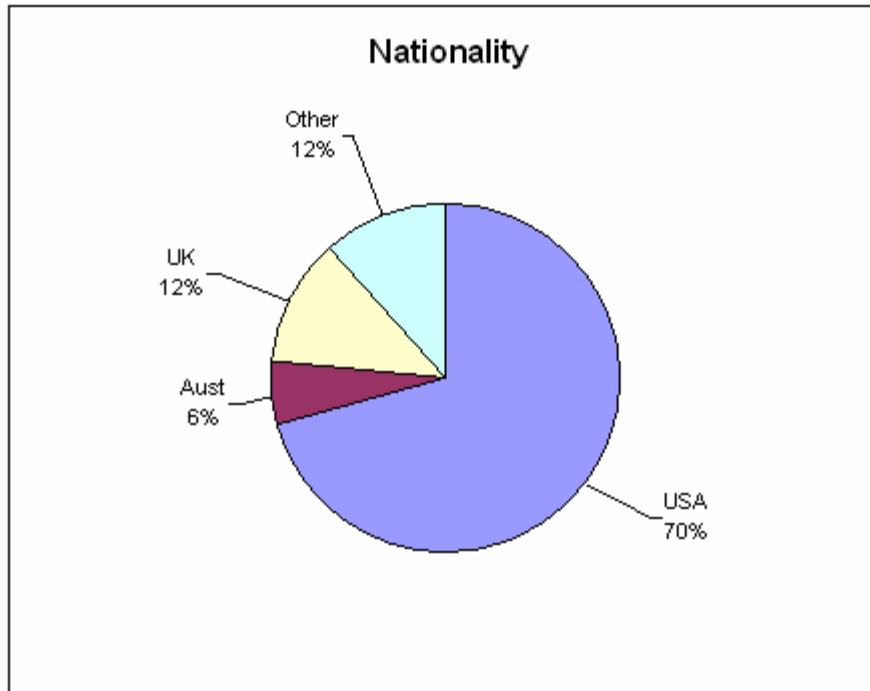


Figure 6: Piechart of nationality of literature

## Quality of evidence

Figure 7 summarizes the methodologies used in the studies included in this review. Most (52%) of the research was completed using a qualitative methodology. Secondary data analysis is found to be the second most frequent form of research (22%), followed by expert opinion (17%) and quasi-experimental methodologies (6%). No systematic reviews or randomised control trials were located in any of the reviewed papers, which may render weak scientific results. Nonetheless, the typically high age range of the investigated population (59% of papers investigated a population over the age of 70) and their healthy condition (see Figure 9) may render this population unavailable for rigorous empirical investigations.

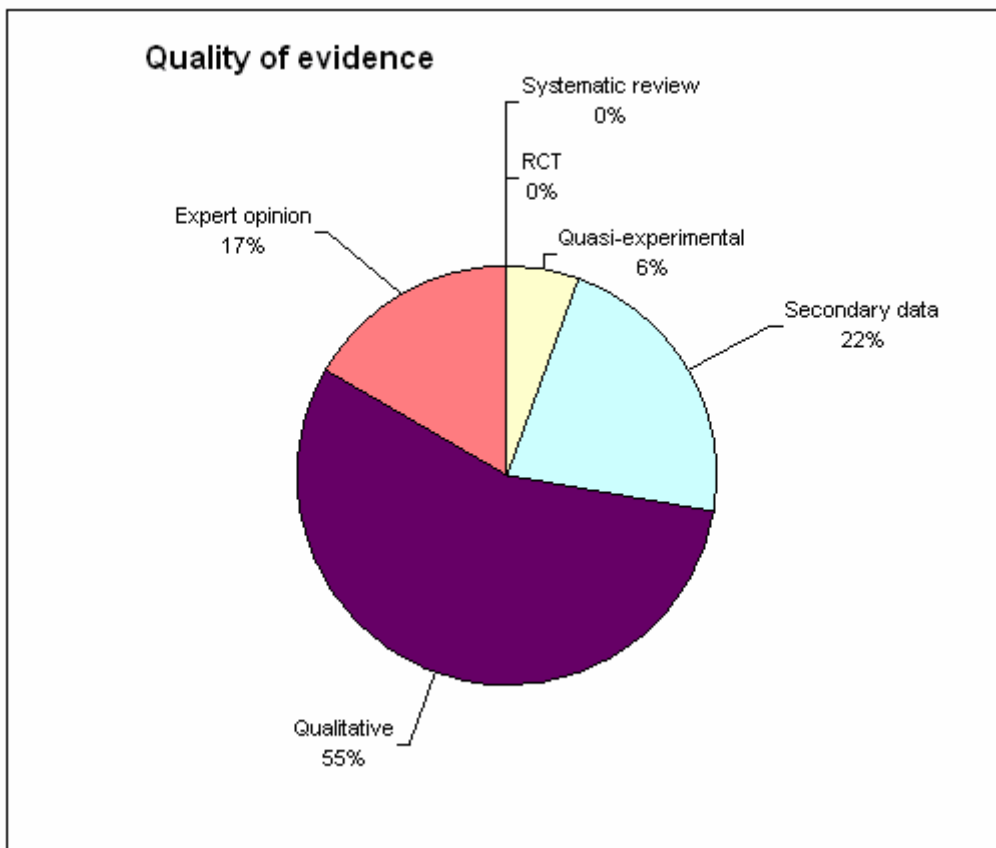


Figure 7: Piechart of quality of research

## Type of disabilities identified in the literature

The systematic review of the literature yielded interesting results concerning the types of disabilities experienced by people with a need for home modifications. While many studies investigating home modifications concern elderly people with physical impairments as the major disability (ABS Disability and Carers Survey, 2003), 30% of the participants investigated in the reviewed papers had some form of psychological disability, either alone or with a physical disability; only 24% of the papers involved participants with only physical disability. The remaining 46% of the papers did not specify the type of disability participants experienced. The presence of psychological disability in the investigated populations may be related to the incidence of psychological resistance to home modification, but the papers reviewed do not permit a definitive conclusion about the relationship between the two. For a more thorough discussion on each of these barriers, see the Discussion section.

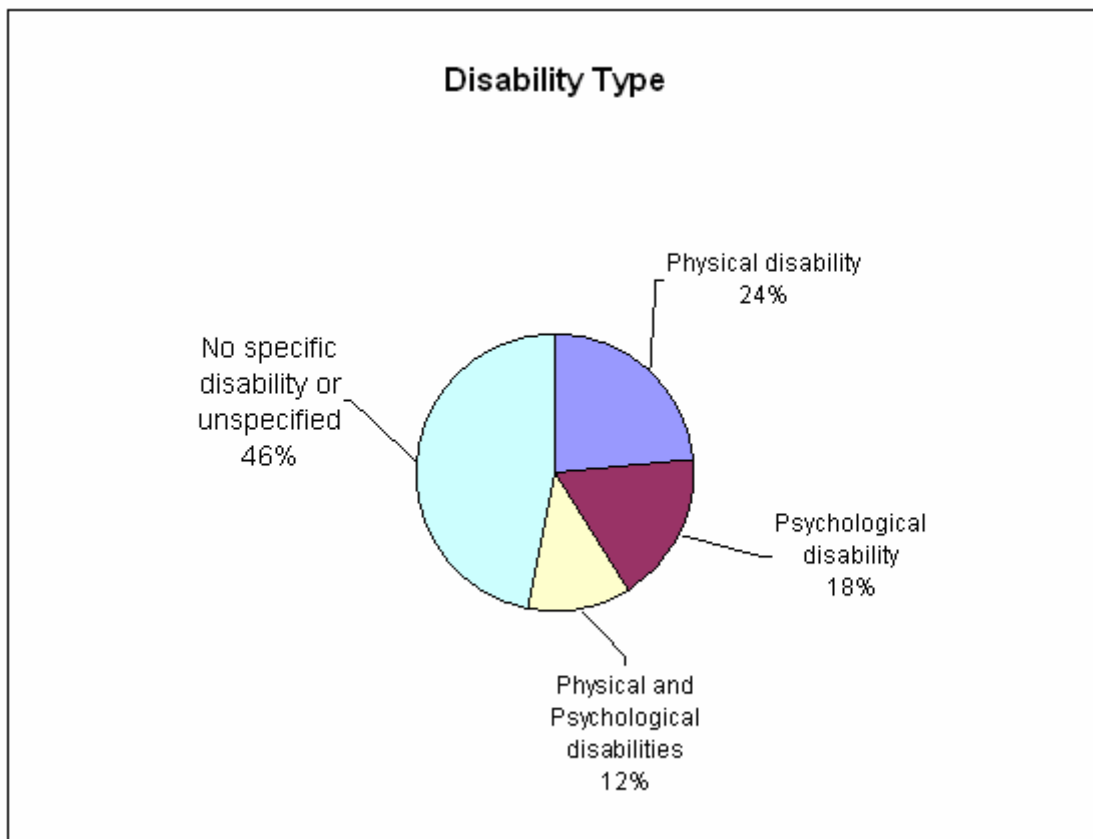


Figure 8: Disability types

## Analysis outcomes

The main purpose of this review was to identify barriers to the provision and uptake of home modifications so that clinicians can better identify the concerns and perceptions of home modification by the consumer and tailor their practices accordingly. The desired outcome of this practice change may be to help consumer enjoy more the benefits of a home environment designed to enable occupants to perform activities of daily living.

The findings of the literature review highlighted seven barriers that need to be overcome in order for a people to choose to implement necessary home modifications:

1. Financial problems
2. Lack of knowledge/information
3. Lack of social support to make positive change
4. Perception of no need
5. Concern about stigma (e.g., embarrassment about outward signs of disability)
6. Concern about desirability and aesthetics
7. Tenure.

Each of these barriers will be discussed more thoroughly in the next section.

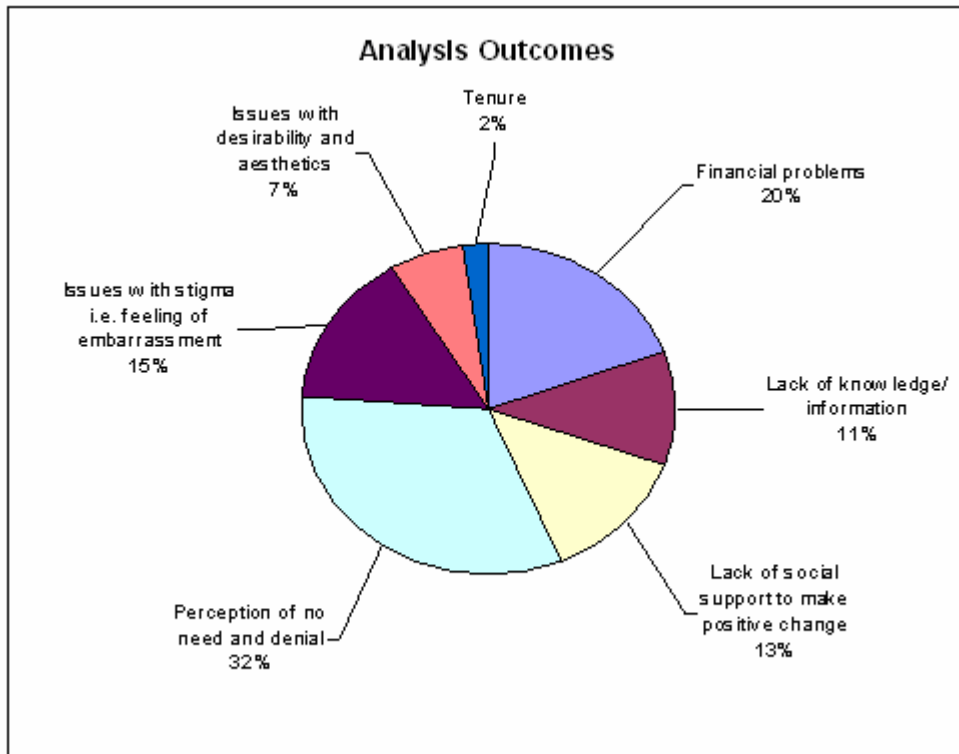


Figure 9: Barriers to home modification

## Discussion

The seven barriers to home modifications depicted in Figure 9 fall into two main categories: practical and psychological. Practical barriers include financial problems, lack of knowledge, aesthetics/desirability, and tenure. These practical barriers were mentioned in 40% of the reviewed papers. Psychological barriers to home modifications include concerns about stigma, lack of social support, and perception of need. These psychological barriers were mentioned by the majority of the papers (60%). It is possible that the prevalence of psychological resistance to home modifications is linked to the presence of psychological disorders in the investigated populations (see Figure 8). The data, however, were not reported in such a way to permit the conclusion that participants with psychological disabilities were any more likely to report psychological barriers to home modifications.

Although it is crucial to strive for a complete understanding of each of the seven identified barriers in order to overcome the current resistant to home modifications, this review clearly emphasises the need to focus not only on interventions services that provide practical aid such as financial assistance, but also on possible psychological assistance that can target more specifically the psychological resistance to home modifications.

Brooks, et al. (1991) have also stressed the importance of considering psychological factors among others in order to boost necessary environmental changes for those who experience functional impairments:

“It will be valuable to consider simultaneously the combined effects of biological, medical, psychological, social, and physical settings in the disability experience. Dynamic research into the complex and interactive features of disability can be conducted as people with disabilities bring changes to the very social and environmental systems that intimately influence their life conditions and social interpretations.”(p. 1423).

The following paragraphs discuss in more details each of the seven barriers specifically identified in the present literature review while highlighting possibilities for future research investigations as well as useful interventions to encourage necessary home modifications.

### Barrier 1: Financial Problems

The cost of modification is a barrier to many people (e.g. Naik & Gill, 2005; Tabbarah, Silverstein & Seeman, 2000). Research in the USA found that over one-third of persons with unmet modification needs indicated that the primary reason was unaffordability (AARP, 1996). Indeed, previous research (ABS Disability and Carers Survey, 2003) as well as this systematic review have shown that people with modification needs often have a low Socioeconomic Status (SES), high unemployment rates and are females who tend to live alone and do not own their dwellings.

Whilst there are a number of schemes available to assist with the cost of modifications, it is uncertain how much consumers know about these schemes. Consumers and landlords may also be uncertain about how modifications will affect the resale value of their property, especially when major modifications, such as external ramps, are involved. Future research should not only identify the specific level of consumer knowledge of available schemes and services, but also identify the most efficient ways to distribute the relevant information to the public.

### Barrier 2: Lack of Knowledge/Information

General knowledge and acceptance of the formal service system are generally viewed as better predictors of use than the demographics of functional capacity (Wylde, 1998). Many potential consumers are unaware of programs (E.g., Naik & Gill, 2005; Gitlin, 1995; Cumming, et al. 2001); in Australia, as in the United States, there is a general lack of ‘help lines’ or cross-service information

that outline eligibility criteria. Advertising appears to be the most effective way to educate consumers, and to date this has been a very low priority for service providers whose basic mission has been to minimise service demands.

Education needs to meet consumers on their terms in their preferred language (Clemson, Cusick, & Fozzard, 1999). Additional research needs to be conducted with consumers about preferences for language, images, and packaging. Aesthetics must be improved; need alone is not enough to sell products. Home modifications need to be presented with zest, enthusiasm, joy, creativity, and an emphasis on added-value and cost/benefits.

### **Barrier 3: Lack of Social Support**

Some older people regard the process of making major modifications to their home as too complicated and are unaware of available support. Some studies have determined that the probability for completing home modifications rises as people have more social support (Roelands, Van-Oust, Buysse, & Depoorter, 2002; McCullagh, 2006).

Further research should determine the types of social support (e.g. psychological, physical or practical) that are the most likely to increase the uptake of home modification services.

### **Barrier 4: Perception of no Need and denial of disability**

Many people fail to acknowledge that they need to modify their homes. This situation is well summarised by McCullagh (2006, p.56) who states:

“But some people have to make a psychological adjustment to the idea of modifying a home. They may be reluctant to alter a cherished or familiar home or fear the prospect of their own decline. In one study, respondents' explanations for not making suggested home modifications included failing to see any reason to make changes (49%)”.

Individuals who experience a severe or chronic disability or are diagnosed with a sudden traumatic dysfunction often implement psychological strategies to help them cope with the anxiety associated with functional losses. These strategies preserve individuals' sense of self worth during adjustment to the physical, functional and environmental limitations being experienced even though they may appear to be irrational from the perspective of outsiders (Katz et al., 2002; Prigatano & Klonoff, 1998). Research has shown that psychological strategies may involve either a gradual psychological adaptation process (Calabro, 1990; Wister, 1989), brief defensive mechanisms such as denial, repression and rationalization (Katz et al., 2002), or psychological responses that involve both types of processes (Calabro, 1990).

Elderly people diagnosed with a chronic or ongoing dysfunction tend to continue their psychological adaptation to their physical environment to a greater extent than implementing environmental changes designed to ease their living conditions (Wiser, 1989). On the other hand, denial often presents as a coping protective mechanism particularly associated with traumatic/sudden onset of disability. Therefore, a lack of insight in regard to problems is evident in the Psychosocial Adjustment to Illness Scale (PIAS) being closely correlated with the severity of a head injury (Hickey, O'Boyle, Mcgee, & McDonald, 1997). Aside from lack of insight, denial can involve a belief system that considers the functional impairment to be temporary, views the residential situation as safe and comfortable and/or perceives the investment as being too great. Further, any decision making entails predicting the future and oftentimes people imagine how the outcomes of their choices will make them feel (emotional consequences) so it is not uncommon to avoid what we fear (home modifications are for old people, not me) (Douglas & Jones, 2007). However, when the level

of dysfunction tips from intermittent or moderate to severe, denial is replaced by action (Gitlin, 1995).

It is for this reason, that education about the specific benefits of specific home modifications may help some consumers see their personal needs could be met by home modifications. Similarly, educating consumers with progressive diseases about what to expect in future years may encourage them to undertake modifications sooner rather than later. Research could help to identify effective ways to help consumers see the personal benefits of environmental change.

### **Barrier 5: Concern about stigma**

People who need home modifications often are concerned about stigma associated with modifications, especially external modifications (Aminzadeh and Edwards, 1998). Potential home modification clients are concerned that home modifications will make their disability obvious to others and that family members, landlords, or neighbours will disapprove.

The popular concept of disability traditionally focuses on deterioration or deviation, rather than on the full spectrum of ability and/or enablement (Chiriboga, Ottenbache, & Haber, 1999)). Despite failure to view disability within the wider spectrum of human ability, a significant and increasing percentage of the population at large experience functional limitations as a direct result of occupational injuries, home accidents, road trauma, crime, genetics, and/or the onset of chronic disabling conditions associated with the ageing process.

Determining the exact number of individuals with disabilities or limitations is not an easy task because many people do not want to be thought of as disabled, and people who are employed or are otherwise productive despite significant functional impairment do not consider themselves to be *disabled*.

This barrier presents a two dimensional problem: how to modify society's response to people with disabilities (eliminate the stigma) and how to encourage people with disabilities to take action to improve their home life without concern about others' responses.

### **Barrier 6: Issues with Desirability and Aesthetics**

The need for more careful consideration of the potential effect of objects on users is not a new idea (Hocking, 1997; Marcus, 1997). Hocking encourages us to apply this wider understanding of home modifications to our assessment strategies and therefore to our daily practice. As a profession, occupational therapists pride ourselves on understanding function, particularly in terms of the variability of human ability. The effect of objects on users, however, goes beyond pure function. As with any home design change, the effect of home modifications on consumers includes aesthetics. Many home modifications and assistive devices have been created for small niche markets and therefore may not be attractive and may not come in a range of colours or styles. Many are likely to confront potential consumers with their disability because they are suggestive of hospitals or institutions.

### **Barrier 7: Tenure**

An additional issue that has received little coverage in the literature, but that the study team considers to be significant, is tenure. Whilst some evidence in this area has come from comments by service providers in the web discussion forum hosted by HMMINFO ([www.homemods.info.au](http://www.homemods.info.au)), more recent analysis of the ABS Disability and Carers Survey (2003) by Bridge and Phibbs (2007) showed a clear pattern of significant differences in home modification rates amongst tenure types even after controlling for age.

## Conclusions

Our understanding of why people choose to accept or reject environmental modifications that may improve their quality of life is still developing. We know from previous research and practice that it is a complex matter that may be shaped by a variety of factors. This literature review has identified seven themes of resistance to home modifications that can be classified as either psychological (denial of need, concern about stigma, lack of social support) or practical (financial problems, lack of knowledge, aesthetics and desirability). The psychological barriers may be explained by the prevalence of psychological disabilities among the study participants. A number of the studies reviewed, however, included participants with both physical and psychological disabilities, and the two forms of disability may be related. Gitlin et al. (2001) suggest that events that disrupt function tend to increase an older adult's vulnerability to psychological dysfunction. Gitlin, et al. (2001, p. 786) concluded: "Longitudinal studies are required to disentangle the complex relationships between physical and psychological function and environmental adequacy. An understanding of these complex relationships would enable effective intervention strategies to be developed that support older people's desire to age at home." See also Lewinsohn, et al. (1985). Regardless of the cause of psychological resistance to home modifications, services and programs must provide not only practical assistance, but also aim to overcome the psychological barriers. Such services may include: routine assessments for environmental modifications as part of clinical practice, daily consultation services such as 'help lines', the use of popular media to deliver relevant information, and the distribution of knowledge suited to various local populations via community centres.

## Findings

- Seven sources of resistance were identified in the literature: financial problems, lack of knowledge, desirability and aesthetics, and tenure, lack of social support, perception of no need, concern about stigma,
- These barriers were classified as either psychological or practical resistance to home modifications.
- In the literature reviewed, psychological resistance to home modifications (i.e., lack of social support, perception of no need, concern about stigma) was more common than practical resistance. While this may be linked to the prevalence of psychological disorders among the investigated populations, additional research is needed to confirm that people with psychological disabilities are more likely to experience psychological resistance to home modifications.
- Most of the demographic characteristics identified in this review are similar to those found previously, which portray a picture of elderly females from low SES as the most typical population to be identified with a need for home modifications.
- Intervention programs and services are encouraged to develop new strategies that will focus more specifically on the psychological resistance to home modifications.

## Information/Intervention Strategies

- Routine assessments for environmental modifications as part of clinical practice.
- Daily consultation services such as 'help lines'.
- Use of mainstream media (electronic, printed, broadcast, etc.) to deliver relevant information.
- Distribution of knowledge suited to local populations via community centres with attention to preferred languages, images and packaging.





## Research Strategies

- There is a considerable lack of research pertaining to resistance to home modifications within Australia. Future research should investigate whether specific resistance issues, not mentioned in this review, arise within Australia.
- There is a need to research the special needs of environmental modifications of the minority groups residing in Australia.
- Considering that resistance to home modifications was found to be either psychological or practical, there is a need to explore which of these types of resistance has a stronger predictive effect on the consumer behaviour and whether psychological resistance is more common among potential consumers with psychological disabilities.
- Because 'lack of information' was identified as a possible barrier to home modifications, research should investigate what consumers know about available services and assistance and identify the most efficient ways to distribute the relevant information to potential consumers in various communities.



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# Appendix 1

## Matrix of literature included in analysis

Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method						
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative	Expert opinion
1	(Aminzadeh & Edwards, 1998)	Canada	Identified range of attitudinal, normative, perceptual and access barriers however standards varied between artefacts with bathrooms modifications being less stigmatised.	Convenience sample of 30 community living older persons. Focus group method.					x	x	x							X
2	(Sheldon & Teafor, 2002)	USA	Approximately 40% of recommendations are implemented. Better explanation and evidence for effectiveness are needed.. The length of time between problem identification and installation was also mentioned as a barrier.	Convenience sample of 20 primary caregivers. Observational case-study design					X									X
3	(Roelands, Van-Oust, Buysse, & Depoorter, 2002)	Belgium	The majority already had assistive devices and the majority had borderline positive about them resulting from care substitution also featured as concerns. Although this varied. Subsidies and the fear of loneliness.	Interview of (n=117) community living elders receiving home nursing.	X				X									X
4	(Tabbarah, Silverstein, & Seeman, 2000)	USA	The greater the limitation with activities of daily living the greater the chance that there will be home modification uptake. However ethnic minorities and those on low incomes were	Secondary data analysis	X													X



Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method					
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative
			significantly underrepresented.														
5	(Messecar, Archbold, Stewart, & Kirschling, 2002)	USA	Primary barriers were discrepant views on functioning of the elder. However discrepant views between consumers and professionals was also mentioned and it was stated that this might be assisted by better understanding how caregivers frame purpose e.g. the data revealed 44 modification strategies which were categorised into one of seven purposes: organising the home; supplementing function; structuring the day; protecting the person; working around environmental barriers; enrichment and transitioning..	Interview of 24 caregivers.	X		X	X	X								X
6	(McCullagh, 2006)	USA	No established standards for making home modifications. Major barriers are psychological adjustment i.e. failing to see any reason to make changes, perceiving the existing environment as safe and believing oneself not to be at risk.	Case composites, literature review and expert opinion	X	X	X	X	X	X	X						X
7	(McCreadie & Tinker, 2005)	UK	A complex model of acceptability exists, in which felt need combines with product quality factors. Housing type and user characteristics	In depth semi-structured interviewing of 67 older people known to be in receipt of AT and living in social			X	X		X	X						X



Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method					
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative
			combine to produce the felt need component. Attributes of the device such as reliability safety and aesthetics were also important.. Access to AT is restricted by information and contact with suppliers. Acceptability depends on extent to which it alters the home.	housing. Purposive sampling													
8	(Naik & Gill, 2005)	USA	Major underutilisation. Prevalence was generally less than 50% of AT and was only modestly greater in those with functional limitations. Limited availability was cited as one explanation as was current assessment techniques that fail to address functional status. This combined with financial, educational and structural barriers need further research.	Participants were part of a longitudinal survey of community living people over 70 yrs+. They completed a detailed self-report module on bathrooms 3 yrs after the initial survey as part of the longitudinal follow-up.	X		X				X						X
9	(McNulty, Johnson, Poole, & Winkle, 2003)	USA	Participants in the action stages significantly more home mods (84%) than those in non-action stages (i.e. precontemplation, contemplation and preparation. Reasons for inaction were too big a change, changed mind about need and not in agreement about need.	Convenience survey of 20 communities living elder (61-73.8) s. with 12 week follow up to measure carry through.		X		X	X	X	X						

Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method						
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative	Expert opinion
10	(Mathieson, Kroenfeld, & Keith, 2002)	USA	Subjective income measures and access to subsidy had significant effects on adaptations despite the fact that enabling factors do not account for much of the variance in health behaviours.. Consideration of financial factors and marketing is crucial. Uptake is higher for older females, living alone. Presence of chronic conditions and perceived health also significant.. Need characteristics accounted for 15% of variance but this is not linear and diminishes at higher levels of impairment..	Survey of stratified random-sample participants (n=3,485) in a national survey of non-institutionalised elderly. Multinomial logistic regression used to estimate significance.	X				X						X			
11	(Gitlin, Mann, Tomit, & Marcus, 2001)	USA	Combination of demographic and functional conditions increase home modification need.	Predictive analysis based on analysis of longitudinal consumer assessment survey.	X	X		X	X							X		
12	(Gitlin, 1996)	USA	Research suggests that older adults do not use assistive devices. Predisposition (socio-economic, gender, race and age); Need (functional impairment & Enabling factors (social support, psychological readiness). Lack of: access, finance, knowledge were discounted in this study as devices were provided and clients educated for free. The two most significant predictors	Prospective exploratory investigation of convenience sample discharged after stroke, amputation or orthopaedic intervention with 1-2 devices.	X	X	X		X							X	X	





Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method						
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative	Expert opinion
			were positive device orientation and expectation of use.															
13	(Gitlin, Corcoran, winter, Boyce, & Marcus, 1999)	USA	Caregiver characteristics influence home modification uptake. Multiple regression analysis only predicted being an older female caregiver as significant but other psychological factors such as depression, upset, self efficacy are considered important.	In-home semi structured interview and intervention protocol with 5 home visits. Part of a study examining management of behaviour and functional dependence problems. Convenience sample (n=100)		X		X										X
14	(Gitlin, Luborsky, & Schemm, 1998)	USA	Perceptions of users are critical to uptake. Six dimensions of concern were found including operation and utility; social contexts; attribution of cultural meanings; and consequences. Reluctance can not be simply ascribed to denial or non-compliance.	Structured qualitative approach using elective probes to get patients (n=52) to describe device perceptions				X		X								X
15	(Gitlin, 1995)	USA	Studies vary significantly in sample size, sampling procedure, population groups and findings. Disability type is significant i.e. high uptake with visual impairment and low uptake with cognitive impairment.	Literature review			X		X	X								X
16	(Cumming et al., 2001)	Australia	Just over half of the sample carried out 50% of recommendations but 21 % had made no modifications while another 21% has made only some modifications.	In-home follow-up (n=121) one year after receipt of Occupational Therapy intervention			X											X



Reference number	Reference	Nationality	Main Findings	Process & Issues	Barriers							Method						
					Finance	Insight	Knowledge/information	Social support	Perception of no need	Denial	Stigma	Aesthetics	Systematic Review	RCT	Quasi-Experimental	Secondary data	Qualitative	Expert opinion
			Unable to identify a set of predictors However many older people do not believe that home modifications are effective in fall prevention and this fits with transteoretical model that readiness to act had not occurred.															
17	(Brooks, 1991)	UK	Social setting and disability type impact usage. Devices were sometimes seen as unreliable and restricting.	Postal survey of scientists and engineers with disabilities (n=595). Convenience sampling.	X		X			X								X

## Appendix 2

### Reference list of literature included in matrix

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