

The Contribution of Behaviour to Falls Among Older People In and Around the Home

C L Brace, R A Haslam,
K Brooke-Wavell, P A Howarth

Health and Safety Ergonomics Unit
Department of Human Sciences
Loughborough University
Loughborough
Leicestershire
LE11 3TU

Summary

Falls in the home are a major problem for older people. Although personal and environmental risk factors for falling among this group are well understood, less is known about how these risks are influenced by behaviour. Also of interest is the extent to which the design of domestic products might be a factor in falls. The aim of this investigation, therefore, was to improve understanding of how older people keep and use their homes and to assess the implications for home safety.

In the first instance, 5 focus groups were conducted with older people (30 participants in total) to gain insight into the problem. The discussions were used to collect preliminary information on patterns of behaviour likely to affect risk of falling, informing the design of materials for the subsequent interview survey.

The main part of the study involved semi structured interviews with 177 older people (150 households), aged 65–99, in their own home. Quota sampling was used, based on age and gender using estimated population figures from the UK, and according to type of accommodation. Properties were selected both by age and type of housing, using national estimates of housing stock. Issues explored by the interviews included respondents' perception of factors affecting risk of falling in the home, understanding of immediate and longer term consequences of having a fall and the value and acceptability of preventative measures. The interviews involved detailed discussion of different areas of the home, and the interviewee's fall history. In addition, standard anthropometric dimensions of interviewees were recorded, along with other measurements including grip strength, ability to get off a stool without using hands, spectacle wear and measures of visual acuity and depth perception.

The majority of respondents reported that they use the various rooms in their home as and when necessary, with living rooms and bedrooms occupied for the greatest amount of time. No examples were seen where householders had migrated to one room.

Some 20% of participants reported not using their gardens often, due to mobility and balance problems, combined with a difficult environment and access. Floor surfaces in the garden were perceived to affect fall risk, due to changes in level, surface, texture, with the presence of uneven ground, slopes, and steps. Ice, frost and rain were common reasons for avoiding entering the garden because of a perceived increased risk of falling. ‘Garden clutter’, including plant pots and hosepipes, was also an issue.

Two thirds of respondents (66%) reported rushing around the home to some extent, although 94% recognised there might be risk involved with this. Frailer individuals were less likely to report hurrying around the home than those who were more mobile ($p<0.001$).

Over 90% of participants thought that leaving things on the floor would increase the risk of having a fall, although 80% of participants admitted to having some amount of clutter in their homes.

In over two thirds of homes (69%), various changes had been made to the environment with the aim of improving safety and 38% of interviewees reported having made safety changes to their behaviour, due to declining physical abilities.

Of the 79% of participants who take one or more prescribed medications daily, 1 in 10 (13%) reporting having experienced side effects that might affect risk of falling. One third (32%) of participants reported using some form of walking aid within their home, although 25% mentioned that their particular device caused them problems with regard to risk of falling in the home. Problems included manoeuvrability and storage.

The study has highlighted a number of product design factors affecting fall risk, relating to items such as portable steps, domestic appliances, footwear and walking aids, the improved design of which could make a useful contribution to safety and general ease of use.

It is clear from the findings of the study that there are many situations where the decisions and actions of older people affect their risk of having a fall. On the one hand, risk is affected by how older people equip, furnish, look after and use their homes. On the other, behaviour affecting individual capability plays a role through influences such as use of medication and alcohol, ability to see correctly (eye tests and correct use of spectacles), and exercise (building and maintaining physical fitness).

Only 4% of study participants could recall ever having received any advice on fall prevention.

Confronting the problem of older people falling in the home requires a holistic, ergonomics approach that addresses design, behavioural as well as medical and health issues. Falls are a multifactorial problem and need a multifactorial response.

The report concludes that opportunities exist to reduce the risk of older people falling in and around the home, both with respect to behaviour and the design of products and buildings. Most importantly, the investigation has established that there is a need to raise awareness of the problem and provide practical fall prevention advice.

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1 Introduction

Falls are a serious problem among older people affecting both health and overall quality of life. As well as injurious physical consequences, falls often lead to reduced self confidence, fear of falling and reduced activity. The disproportionately high number of falls among the over 65 age group are due to the interaction of declining abilities and the challenges present in the environment.

A substantial body of research exists dealing with intrinsic factors (internal to the individual, e.g. health problems) affecting fall risk. Extrinsic risk factors (external to the individual, e.g. environmental features) have also received attention. There has been relatively little work, however, examining the contribution of behaviour to risk of falls among older people. This scarcity exists despite leading fall researchers arguing that falls arise due to a combination of infirmity, behaviour and environmental factors.

The work presented in this report builds on a previous successful study by the Health and Safety Ergonomics Unit, Loughborough University, for the DTI, which examined behavioural and environmental factors affecting risk of falling on stairs in the home. This report expands on that work by widening the scope to consider behavioural and environmental factors affecting risk of falling in other areas of the home setting.

This study used a combination of literature review, focus groups and detailed home interviews conducted with older people, to investigate how individuals keep and use their homes, regarding the implications for risk of falling.

2 Literature Summary

2.1 Introduction

Hill et al., (2000) reported findings from a study which examined factors affecting the safety of older people on stairs. The research presented in this report builds on that work, investigating behavioural and environmental factors affecting risk of falling in other areas of the home.

This study was commissioned as a contribution to 'Avoiding Slips, Trips and Broken Hips' run by the Department of Trade and Industry (DTI) in collaboration with Health Promotion England.

This second Loughborough study has used a similar approach to the stair study, involving visits to older people in their homes, asking householders about their use of different areas of the house and attempting to determine older people's knowledge concerning fall risks.

The causes of falls have received wide attention, with an emphasis now on identifying and understanding effective methods of fall intervention. Recently published significant reviews have summarised the key findings from the literature. These major reviews have been appraised in this report.

2.2 Background to the problem

At least two decades ago it was recognised that a third of individuals over 65, and nearly half of those over 80, fall each year (Prudham and Evans, 1981), with little impact on the scale of the problem during the intervening years. Approximately half of all recorded fall episodes that occur among independent community dwelling older people happen in their homes and immediate home environments (Lord *et al*, 1993). The most recent Home Accident Surveillance System (HASS) data reveal that in 1999, 324,000 older people in

the UK received injuries from a fall in the home severe enough to require attendance at a hospital A&E department (DTI, 2001a). These figures do not include patients seeing their GP or those not seeking treatment.

The consequences of falling for older people can be traumatic and seriously disabling. Falls pose a threat to older persons due to the combination of high incidence with high susceptibility to injury. The tendency for injury because of prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a low impact fall dangerous (Josephson *et al*, 1991).

Falls can lead to three types of impairment: injury, restriction of activity, and psychological distress. Issues can include anxiety of falling again, restrictions in activity/mobility, and increased need of assistance (Cwikel *et al*, 1990). The cost to individuals and society is great and likely to increase in line with general ageing of the population.

2.3 Risk factors

There are numerous risk factors for falling. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls and subsequent injury. Extrinsic factors are environmental hazards that may initiate a fall to occur. Fall incidents are generally multifactorial in their origin.

Intrinsic factors involved in falls among older people include decreased balance ability, disturbed gait, cognitive impairment, reduced strength, impaired vision, illness, and side effects from use of medication (Askham *et al*, 1990). With regard to vision, depth perception and judgement of distance may both be involved in falls (Davis, 1983; Cohn and Lasley, 1985). General psychological state and experience can also have an effect on the individual, affecting confidence and fear of falling. Issues here include a history of falling, length of lie on floor, range of activities of daily living, and degree of social interaction and support (Tideiksaar and Kay, 1986; Nelson and Amin, 1990).

Extrinsic causes are extensive, and include floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting, problems with walking aids and equipment, lack of hand rails on stairs, badly repaired stairs, ill-fitting footwear, unlaced shoes, high heels, slippers without soles, sensory surround and feedback (audio and visual), placement of furniture, and required activities in the physical environment (Nelson and Amin, 1990; Burleson, 1993).

2.4 Fall prevention

The causes of falls have received wide attention, with an emphasis now on identifying and understanding effective methods of fall intervention. However, it must be noted that most research has been concerned with individuals who have presented to GPs/A&E having experienced a fall. Very little has been done to look at prevention of first falls, which are often a precursor for more serious incidents.

Approaches to fall prevention that have been studied in detail include exercise intervention, home assessment, medication review, and nutritional supplements. Psychotropic and cardiovascular medicine, visual impairment and lighting of the environment, the use of assistive devices, restraints and footwear, and educational/behavioural/cognitive interventions have also been examined. The evidence base is growing in favour of multifactorial approaches to fall prevention (Close et al., 1999; Scott et al. 2001; AGS, 2001).

The primary direct indicator for demonstrating whether intervention methods have been successful is achievement of a reduction in number of falls over a duration. However, this direct indication is often difficult to measure, therefore, indirect indicators are sometimes used to monitor effects, including changes to environment and ability, e.g. balance.

Recently, several expert reviews of the literature on methods of fall prevention have been published (Feder et al., 2000; AGS, 2001; Lamb, 2001; Scott et al., 2001; Gillespie et al., 2002) and evidence tables constructed, resulting in guidelines for the prevention of falls.

These recently published reviews have been summarized in this report (Tables 2.1 – 2.4), and the findings commented upon. Specific attention has been paid to the behaviour and product related issues of falling, due to the interest of the present investigation.

2.5 Summary of intervention reviews

The tables have been grouped under multifactorial, intrinsic, extrinsic, and behavioural intervention strategies.

Key to symbols:

- ☑ Evidence shows benefit in reduction of falls;
- ☒ Evidence shows no benefit in reduction of falls;
- ❗ More research required as benefit unknown.

2.5.1 Multifactorial Intervention Strategies

Table 2.1: Multifactorial Intervention Strategies

Source	Authors' Conclusions
Feder et al. 2000	☑ Programmes that combine interventions reduce falls. Prioritise correction of postural hypotension, rationalization of medications where possible, and interventions to improve balance, transfers and gait.
Gillespie <i>et al.</i> , 2001	☑ Multidisciplinary, multifactorial, health/environment risk factor screening/intervention programmes, for unselected community dwelling older people and for older people with a fall history/known risk factors, are likely to be beneficial. ❗ The effectiveness of home hazard modification in association with advice on optimizing medication, or in association with an education package on exercise and reducing fall risk, is unknown.
AGS, 2001	☑ Multifactorial interventions should include gait training and advice on the appropriate use of assistive aids, review and modification of medication, exercise programmes (including balance training), treatment of postural hypotension, modification of environmental hazards, treatments of cardiovascular disorders.
Lamb, 2001.	❗ Further research is required to demonstrate effectiveness of multifaceted interventions.
Scott et al., 2001	☑ Multiple strategies directed at a wide range of risk factors are shown to be effective, and a multidisciplinary approach addresses the complexity of cumulative risk factors.

2.5.2 Intrinsic Intervention Strategies

Table 2.2: Intrinsic Intervention Strategies

Exercise Interventions	
Source	Authors' Conclusions
Feder <i>et al.</i> , 2000	<p>✓ A small number of trials have shown a reduction in the rate of falls after exercise, but others showed no significant effect. Recommend tailored exercise programmes to be targeted at high-risk groups and administered by qualified professionals.</p>
Gillespie <i>et al.</i> , 2001	<p>✓ A programme of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional, is likely to be beneficial.</p> <p>✓ A 15-week Tai Chi group exercise intervention is likely to be successful.</p> <p>ⓘ The effectiveness of group delivered exercise interventions is unknown.</p> <p>✗ Brisk walking in women with an upper limb fracture in the previous two years unlikely to be beneficial.</p>
AGS, 2001	<p>✓ Older people who have had recurrent falls should be offered long term exercise and balance training</p> <p>ⓘ Tai Chi is a promising type of balance exercise, although it requires further evaluation before it can be recommended as the preferred balance training.</p> <p>ⓘ Although exercise has many proven benefits, the optimal time, duration and intensity of exercise for falls prevention remain unclear.</p>
Lamb, 2001	<p>ⓘ The effectiveness of exercise in reducing falls is unclear.</p> <p>✗ Recommendations to increase exercise may increase falls.</p>
Scott <i>et al.</i> , 2001	<p>✓ Balance training combined with strength and endurance exercise is effective.</p> <p>✓ Tai Chi is the only strategy shown in isolation to be effective.</p> <p>✗ Inappropriate regime/intensity level may increase risk, e.g. brisk walking.</p> <p>ⓘ More research needed to determine appropriate exercises for specific fall problems and populations.</p>

Medication Interventions	
Source	Authors' Conclusions
Gillespie <i>et al.</i> , 2001	<input checked="" type="checkbox"/> Withdrawal of psychotropic medication likely to be beneficial. <input type="checkbox"/> The effectiveness of pharmacological therapy is unknown.
AGS, 2001	<input checked="" type="checkbox"/> Patients who have fallen should have their medications reviewed and altered or stopped as appropriate in light of their risk of future falls. Particular attention should be given to older persons taking 4+ medications and to those taking psychotropic medications.
Lamb, 2001	<input checked="" type="checkbox"/> Multifactorial intervention studies including medication management have demonstrated benefit. <input checked="" type="checkbox"/> Evidence that medication withdrawal alone prevents falls.
Scott <i>et al.</i> , 2001	<input checked="" type="checkbox"/> Evidence to support psychotropic drug withdrawal and a reduction in falls.
Nutritional Interventions	
Source	Authors' Conclusions
Gillespie <i>et al.</i> , 2001	<input type="checkbox"/> The effectiveness of nutritional supplementation is unknown. <input type="checkbox"/> The effectiveness of vitamin D supplementation, with or without calcium, is unknown. <input type="checkbox"/> The effectiveness of hormone replacement therapy on falls is unknown.
AGS, 2001	<input checked="" type="checkbox"/> Evidence that the use of HRT, vitamin D supplements, calcium and antiresorptive agents alone do not prevent falls.
Scott <i>et al.</i> , 2001	<input checked="" type="checkbox"/> Medications to enhance muscle strength not shown to be effective. <input checked="" type="checkbox"/> Bone density studies point to benefits of Vitamin D and biphosponate alendronate.

Interventions using assistive aids/devices

Source	Authors' Conclusions
AGS, 2001	<input checked="" type="checkbox"/> Multifactorial intervention studies that have included assistive devices (canes, walkers, bed alarms, hip protectors) have demonstrated benefit. i There is no direct evidence that the use of assistive devices alone prevent falls.
Lamb, 2001	i There is no direct evidence that the use of hip protectors alone prevents injury rates.

Cardiovascular Interventions

Source	Authors' Conclusions
AGS, 2001	i The effectiveness of cardiovascular interventions, including medication change and cardiac pacing is, as yet, unknown.

Visual Interventions

Source	Authors' Conclusions
AGS, 2001	i The effectiveness of interventions for visual problems is unknown.

Footwear Interventions

Source	Authors' Conclusions
AGS, 2001	i The effectiveness of footwear interventions is unknown.

2.5.3 Extrinsic Intervention Strategies

Table 2.3: Extrinsic Intervention Strategies

Home Assessment Interventions	
Source	Authors' Conclusions
Feder <i>et al.</i> , 2001	✗ Home assessment of older people at risk of falls without referral or direct intervention cannot be recommended. A programme of follow up for medical and environmental assessment, with client education about risks and referrals to relevant healthcare professionals should be established.
Gillespie <i>et al.</i> , 2001	<p>✓ Home hazard assessment and modification professionally prescribed for older people with a history of falling is likely to be beneficial.</p> <p>ⓘ The effectiveness of home hazard modification for older people without a history of falling is unknown.</p>
AGS, 2001	✓ When older people at increased risk of falls are discharged from the hospital, a facilitated environmental home assessment should be considered.
Lamb, 2001	ⓘ The effectiveness of home hazard modification for older people is unclear.
Scott <i>et al.</i> , 2001	✓ Evidence suggests that including home modification in intervention strategies is an effective strategy for reducing falls, when combined with education and counseling about reducing risks, financial/manual assistance, and appropriate targeting of older people who are ready to change.
Restraints	
Source	Authors' Conclusions
AGS, 2001	ⓘ The effectiveness of the use of restraints is unknown.

2.5.4 Cognitive/Behavioural/Educational Interventions

Table 2.4: Cognitive/Behavioural/Educational Interventions

Source	Authors' Conclusions
Gillespie <i>et al.</i> , 2001	❶ The effectiveness of interventions using a cognitive/behavioural approach alone is unknown.
AGS, 2001	<p>☑ Multifactorial intervention studies that have included behavioural and educational programmes have demonstrated benefit.</p> <p>☒ There is evidence that the use of behavioural and educational programmes alone do not prevent falls.</p>
Lamb, 2001	<p>☒ It appears that the use of health education and promotion programmes alone do not prevent falls.</p> <p>❶ The relative contribution and effectiveness of interventions using health education and promotion programmes within multifactorial intervention studies is unknown.</p> <p>❶ The effectiveness of cognitive behavioural interventions is unknown.</p>
Scott <i>et al.</i> , 2001	<p>☒ There is little evidence that education programs alone are effective.</p> <p>☑ Interventions using health education and promotion programmes within multifactorial intervention studies may be effective.</p>

2.6 Behaviour and fall prevention

It seems self-evident that the behaviour and actions of individuals affect their exposure to risks, although few studies have examined the influence of behaviour on risk of falling (Askham *et al.*, 1990; Hill *et al.*, 2000; Haslam *et al.*, 2001). This is despite leading fall researchers arguing that falls arise due to a combination of infirmity, behaviour and environmental features (Templer, 1992; Lord *et al.*, 2001).

Lord *et al.*, (2001) describe a model of the interaction between an older person's competence and the demands of the environment. The model suggests that as a person ages and their physical abilities decline, they have a higher risk of falling when environmental hazards occur in the environment, because of the individual's reduced

ability to be able to cope with these hazards. For example, a frail older person may fall after slipping on ice, due to impairments in reaction time and balance. However, a more able person might be able to recover their balance after slipping, due to quicker responses, so as to prevent a fall.

Lord *et al.*'s model is useful when considering the results of studies that investigate the environment and the individual in terms of fall risk. The type of environmental challenges that people choose to expose themselves to (risk taking behaviour) is an important component of the interaction between the person and their environment (Lord *et al.*, 2001).

2.7 Modifying behaviour

In one of the few other studies that has examined behaviour explicitly, Cumming *et al.* (1999), concluded that health professionals (occupational therapists) visiting the homes of older people may result in changes in behaviour that allow older people to live more safely in both the home and the outside surroundings. In this study, a change in behaviour meant performing specific daily tasks in a safer manner, which included reference to use of footwear.

The randomised controlled trial by Cumming *et al.* was designed to test whether home visits by an occupational therapist could reduce the risk of falls among community living older people. The intervention, which emphasized the identification and removal of potential hazards in the home, was found to reduce the number of falls during a 12-month period, but only among a small subgroup (39%) of individuals, who had all reported falling in the previous year. Removal or modification of potential hazards in the home was the central feature of the intervention, although, among the participants who had fallen in the past year, the intervention was equally effective in reducing falls at home and away from the home. This lack of specificity suggests that other aspects of the intervention must have been accountable for the reduction in falls (Gill, 1999). The

unanswered question is whether raised awareness, knowledge and understanding then translate into safer behavioural practices and ultimately reduced number of falls.

Research has shown that older people who attended meetings on fall prevention education, consequently undertook more aerobic exercise and made more safety modifications to their homes than a group of controls (Deery *et al.*, 2000). Although these are indirect indicators, they are a useful measure of behaviour and associated activities.

Hilliard *et al.* (1999) examined behaviour and fall risk (in a hospital setting) by exploring the relationship between cultural values, beliefs and practices in a paper discussing a Middle Eastern study. For example, the research investigated the significant cultural characteristics such as ablution in preparation for prayer, fasting during Ramadan, and social interaction requirements, to see if they had any effect on frequency of falls. It was assumed that at prayer times participants placed their feet in the sink to perform ablution, perhaps resulting in slips on wet floors, although the results revealed that the majority of bathroom falls occurred outside the range of prayer time. It was anticipated that participants' lack of food and liquids during Ramadan might result in higher fall rates. However, results demonstrated that this was not the case, perhaps due to changes in behaviour where 24-hour routines are altered, and the fact that being surrounded by visitors and friends at this social time may inhibit participants' fall-inducing behaviours.

Although Hilliard *et al.* did not find any significant correlations, they raised the important point of cultural diversity and the fact that fall prevention programmes need to consider culture-specific aspects in their design.

A paper by Clemson *et al.* (1999) reports details of an investigation into older people 'managing risk' and 'exerting control' with regard to fall prevention. A small group of older women were interviewed, in order to explore their reasons for not following through with environmental modifications that had been suggested to them. It was found that the women made decisions whether or not to pursue environmental modification

recommendations based on their knowledge of environmental risks, perceptions of degree of risk, perceived ability to mediate these risks through behaviour and the degree of freedom had in decision making ('exerting control'). The paper also suggests that some older people may be excessively and unrealistically optimistic and over confident when judging the degree of personal risk associated with various events or situations, therefore putting themselves at increased risk of falling ('optimism bias').

2.8 Product related falls

Research investigating falls among older people has given little emphasis to extrinsic factors, such as products used in the home, and the way in which they are associated with fall risk, e.g. household equipment and personal aids

Cassell & Ozanne-Smith (1998) investigated injury in the home and found that although slips typically occur on wet or contaminated surfaces, the most frequently reported tripping hazards in the home included furniture (chairs and beds), mats, steps and stairs, cords and animals. In the garden, tripping was commonly due to uneven paths, hoses and garden surrounds. The authors emphasised the importance of educating householders to keep indoor and outdoor pathways free of items on the floor and furniture. This study also analysed the use of stools and chairs as climbing apparatus during household tasks. The results illustrated that falls due to unsafe actions of this nature rated highly in A&E presentations.

Watson *et al.* (1999) investigated consumer product related injuries to older people and indicated the products most frequently associated with falls (at all levels of severity). These included concrete and other outdoor surfaces and structural features of the home (steps, flooring materials etc.), as might be expected. However, other items frequently connected with fall injuries included furniture (particularly beds and chairs), loose floor coverings (rugs, runners and mats), and footwear. The research also discovered that falls from ladders and injuries caused by mobility aids were recurrent among the older population. Watson *et al.* reported that safety features and products, e.g. slip resistant

flooring, impact absorbing floors and padded hip protectors, have the potential to reduce injurious falls.

Assistive devices and their relationship to falls have been examined to some extent. A study by Sveistrup *et al.* (2002) observed the positioning of grab bars used by (healthy) older people to get in and out of the bath, a common site for injurious falls (Aminzadeh *et al.*, 2002). The study found that older people perceived the assistive devices, at their optimal positions, to be beneficial for their safety. However, the results also exposed that at sub-optimal positioning, the grab bars can be ineffectual, causing further problems for the user.

2.9 Summary

Falls in the home are a major problem for older people. The large number of falls among this group are due to a combination of declining physical abilities and challenges in the environment. Multifactorial interventions have been successful in reducing numbers of falls, although the evidence suggests that efforts targeted at single risk factors in isolation are less successful. The contribution of behaviour to the risk of falling has received only limited attention, although there is some evidence that it is possible to promote safer behaviour and achieve improvements.

A small number of studies have identified how cultural differences may play a role in falls. Although research examining falls among older people has generally given little attention to extrinsic risk factors, research has indicated involvement of features of the environment, such as mats, rugs and pets.

3 Focus Groups

3.1 Aims

The aim of this initial study was to collect information on patterns of behaviour around the home likely to affect risk of falling, specifically to:

- find out how older people keep and use different areas of their home, with regard to risk factors for falling
- assess the extent and accuracy of older people's knowledge of factors affecting risk of falling around the home
- examine how behaviour varies with individual characteristics, such as fall history, strength and vision (i.e. do those at increased risk take more care?)
- collect the views of older people on the nature of fall safety advice they are likely to act upon, the extent of behaviour-related modifications they are willing to make, and barriers to change

3.2 Method

The study used discussion-based focus groups as an effective method of gaining insight into the problem (Morgan and Krueger, 1998). Focus groups are a means of capturing the experiences and opinions of a population. The 'conversation' that results from the technique may not always be factually correct; rather it reflects the attitudes and beliefs held by the investigated population, and is of interest as such.

3.2.1 Participants

Sampling was on a convenience basis, with the primary criterion being age of 65 years and over. Individuals were recruited from existing subject lists, compiled for previous

research on risk of osteoporotic fracture in women (Brooke-Wavell *et al.*, 1995), with additional subjects obtained from local community groups. As a consequence, the sample comprised more women than men. The final sample was 13 males and 17 females, with ages ranging from 65 to 85 years (mean = 72.1, standard deviation = 5.6).

Participants formed five groups, each group meeting on a separate occasion. Three of the groups were of mixed gender. Two single sex groups made up the remainder of the sample. The groups were selected in this way to facilitate discussion across gender and age. See Table 3.1. There were 4 married couples within the sample of 30, resulting in contributions from 26 households. The composition of the groups covered a broad range of housing, varying in age from 7 to 350 years old, and type of accommodation, e.g. bungalow, semi-detached 3-story house.

Table 3.1: Gender and age composition across focus groups

Group Number	Number of participants	Male (N)	Female (N)	Mean age (years)	Standard deviation of age (years)
1	8	3	5	69.0	4.0
2	8	2	6	76.5	4.7
3	2	0	2	66.5	0.7
4	7	3	4	72.6	6.0
5	5	5	0	71.6	5.8

3.2.2 Procedures

Participants were briefed both verbally and in writing about the study prior to arrival. They were informed that the discussions would consider falls in the home (including the garden), seek examples of falls, and risk factors and safety issues that might be involved. However, they were not given any further information prior to the discussion, so as to avoid bias towards any particular issues.

Each meeting lasted approximately 2 hours, with all groups led by the same moderator (a member of the research team). Topics covered by the sessions were:

- examples of falls in the home
- location of possible falls
- causes of possible falls
- self-perceived safety (with regard to falling) in the home
- age-related factors leading to increased risk of falling
- value and acceptability of preventative measures

The focus group discussions were recorded, with the consent of the participants, and recordings subsequently transcribed. Partial transcription was undertaken of key discussion points. Subsequent data analysis involved the researcher identifying concepts within the data and classifying these into appropriate categories. Partial validation of the results was performed through other members of the research team reviewing the data and interpretation.

3.3 Results

The results have been considered under three categories, using the model developed for the stairs research (Hill *et al.*, 2000). The model suggests that risk of falling is affected by the way individuals interact directly with the environment, as a consequence of actions which modify the environment, or through behaviour affecting individual capability.

3.3.1 Direct Interaction with the Home

General home usage

The focus group participants reported moving around their homes freely throughout the day as and when the need arises. As might be expected, use during the night is much less, the exception being the need to travel between the bedroom and the bathroom. Some responses indicated that forgetfulness, connected with ageing, leads to increased movement around the house, causing repeated journeys to fetch something or complete a task.

Some of the members of the focus groups reported that since ‘getting on a bit’ and/or retiring they now move around their houses much more slowly and they take more care about it. It was commented by members of the sample that ‘slowing down’ and extra care are required because of the decline in their physical abilities, as well as the fact that participants no longer need to hurry to get to work etc:

“Since we’ve retired we try to do everything that much slower.”

However, it emerged that some participants do still ‘rush’ around the home at times, even though there was an acknowledgement among focus group participants that hurrying around the home increases the likelihood of having a fall. The most common reasons given for hurrying around the home were to answer the telephone or doorbell, or when getting ready to go out.

Housework

A number of participants reported that cleaning around the house, particularly around the stair area, becomes increasingly difficult with age. Some had overcome this by using a battery operated hand-held cleaner instead of a vacuum cleaner. Vacuum cleaners were an issue raised on numerous occasions. People were concerned about using such appliances, and carrying them around the home:

“Vacuum cleaners – I get my legs tangled up in the flex.”

“It’s not a good idea to have the flex taught as it’s a trip hazard above the ground.”

This applied to other aspects of cleaning, such as accessing high places, e.g. curtains, windows, which were also considered dangerous. Many of the participants had been warned of the dangers of general housework by their concerned family and friends, particularly with regard to reaching, and when using equipment such as chairs and stepladders to gain additional height. Although some people do seem to take notice of

the concern of their relatives etc., others continue with risky activities regardless. This seems to vary depending on the attitude and personality of the individual.

Home Maintenance

Many participants mentioned using stepladders etc. in the pursuit of DIY. Some members of the group had curtailed their own or their partner's activity with regard to use of ladders etc. This was for many reasons, including health issues (dizziness, vertigo), knowledge about the risk of falling, and a reduction in confidence in their abilities.

The design of stepladders, stools and chairs was mentioned, with respect to climbing on them to 'reach up high'. The group spoke of their perceptions of the relative safety of the equipment:

"Chairs aren't too bad really. Stools are generally the same width at the top and at the bottom – can be risky. I've got a good set of little stairs, which splay out at the bottom – I'd rather use those than a stool – they feel safer."

Ladders were also discussed as a method of getting into the loft space. Several of the participants still go up into the loft although others no longer felt safe or had been 'banned' from the area.

Other activities that involve physical movements such as reaching, leaning, twisting, stretching, etc., for example, changing light bulbs/batteries in the smoke alarm, were perceived as hazardous activities with regard to falling. This appeared to be dependant on the anthropometry and fitness of the individuals concerned.

Moving things around the home

Some of the participants would still move furniture around in the home, in order to clean or reorganise, but they tend to recognize their limitations:

“The dust behind the television is nobody’s business but I can’t move it – I’m not even going to try.”

It was widely agreed that carrying bulky or heavy items increases the risk of falling in the home. Reasons presented for this included, vision being obscured, balance being altered, and muscles being under additional strain.

Areas of the home where people feel at risk

The participants spoke of feeling more at risk of falling in certain areas of the home, particularly the kitchen and bathroom, due to slippery floors, animals being present (kitchen) and the nature of the tasks being carried out (e.g. getting in and out of the bath, reaching into cupboards).

In the bathroom, getting in and out of the bath was found to be very difficult, especially as a person ages and loses upper body strength. The positioning of handrails was thought to be important, and it was perceived that handrails opposite one another (on the side of the bath) are insufficient and poorly placed. The participants generally thought that angled handrails on the wall at the sides of the bath, and handrails on the sides of the bath itself, one further back than the other, would be superior and reduce the risk of having a fall. However, these are not routinely found in most homes.

To combat slippery floor surfaces, it was reported that towels are often put on the bathroom floor to soak up any water. It was felt that extra care is taken in the bathroom because of the many perceived risks. Slippery flooring was also a problem mentioned with regard to the kitchen area. It was also suggested that in the kitchen, leaving things on the floor could result in a serious risk of falling, due to the generally ‘busy’ routine of someone in the kitchen, who may often be concentrating on several things at once, and may be distracted from noticing hazards underfoot.

Appliance doors were another issue raised with respect to falling in the kitchen, including oven, dishwasher and cabinet doors that open downwards:

“These pull down doors near the floor can be a trip hazard, you turn around to take your roast out of the oven and the door is still down. You could catch your leg on it...”

Pets

The focus group discussions revealed several aspects associated with pets that have implications for falling. On the one hand, there may be occasions when a pet can be a tripping hazard. A second influence is where pets cause the owner to bend down to pick it up or ‘see to it’, resulting in loss of balance or dizziness. Thirdly, a pet’s food bowl or toys can be obstacles, which if unnoticed may lead to a trip.

Outdoor activities

Members of the focus groups were asked about tasks that they undertake in their gardens that they think are risky in relation to falling. The discussion encompassed the use of ladders, stepladders, stools and chairs, for gaining additional height, e.g., when pruning. Some of the participants continued to use such equipment despite feeling anxious, although others had stopped because of such judgments. However, it was argued that even completing simple, everyday tasks entails a risk of falling:

“I had a fall hanging the washing out. I fell down a step. I’d been going down the step for years. I broke my ankle. I don’t know what happened – all I can think is that I caught my foot on the edge of the path as I walked down the step. I wasn’t paying attention to where I was going.”

Floor surfaces in the garden

It was felt that concrete can be a particular problem to walk on, especially if it is smooth. However, if it has been roughened up, it can be good because ‘one has an increased amount of grip underfoot’. Deteriorated concrete was felt to be poor to walk on and much more risky in terms of falling, especially when it’s breaking up resulting in cracks and differences in height. These conditions were felt to be hazardous. Other floor

surfaces were also reported to be problematic and increase the risk of falling particularly pebbles and stones.

Weather conditions

‘Black ice’, slippery leaves and wet surfaces in the garden area were conditions that were perceived to increase the risk of falling. The point was also raised that during these conditions the temperature is generally very low, which can result in an increased amount of stiffness in the joints and limbs, and an increased risk of falling. Participants mentioned, however, that they take extra care when they go out in these conditions because, when compounded with other issues, such as insufficient grip on shoes, risk of falling is high.

3.3.2 Behaviour Affecting the Home Environment

Fall risks introduced by the occupant(s)

There was recognition that leaving objects on the floor anywhere in the home increases the chances of having a fall. This was highlighted as a particular issue with regard to the hall/lobby areas, especially near the external door(s) of the house, e.g. shoes, bags being left after arrival at the house. However, this did not prevent participants from continuing to store or temporarily place objects on the floor in the home.

Handbag straps were mentioned on numerous occasions, as handbags are apparently often left on the floor in the home (particularly the hallway) with the strap ready to ‘ensnare’ an individual and ‘trip them up’. Rugs were also discussed as being a risk factor in the home environment and were reported to be common items found in the kitchens and hallways of older persons’ homes:

“I know it’s a trip hazard, but I’ve got a plastic carpet protector in my hallway. I don’t want my biscuit coloured carpet to get mucky!”

It was suggested that rugs are a particular problem if placed on a slippery or tiled floor, e.g. on the floor in front of the sink in kitchen. It was acknowledged that one could buy anti-slip rugs. However, none of the members of the group that raised this point had ever bought one.

Furniture on or near the floor was another issue raised, for example, chair legs that stick out into the room were perceived as a hazard for falling. Other issues were mentioned with regard to home furnishings and the possible trip hazards that could exist:

“...the throws you get on furniture – you’ve got to be careful that they’re not hanging on the floor. You can get your foot caught up in them.”

Visitors and visiting

Further sources of items on the floor are those left by visitors to the home, objects that aren’t usually there. A number of participants reported that when they look after young children this can lead to problems:

“If you’ve got young children visiting, it’s quite easy to tread on them or their toys, and whilst moving to get off them to prevent causing damage, you could have a risk of falling. Even just tripping on toys.”

It was commented that visitors to one’s home might also be at risk themselves:

“Every time we have visitors we tell them to mind the step as they come in the front door, because there is a raised threshold. Then there’s a little step down inside the porch – I’ve had friends fall because of it. Could probably do with painting white lines on these areas!”

As well as visitors to the individual’s home, visiting the homes of other people may pose difficulty, due to the unknown hazards in a new environment and a lack of familiarity:

“Our daughter has those raised thresholds in her house. You have to really watch yourself.”

Cohabitation

The focus group participants identified differences in awareness of introduced risks, depending on whether someone lives alone, or with a partner, family etc. A person living alone probably knows when objects are placed on the floor, or liquid is spilt, and can therefore be aware of the risks presented by these issues. However, if someone else in the home causes risks then the person can be unaware of this and have an accident:

“If I spill something on the floor I wipe it up straight away, because I know I’ve done it and I know it’s risky to leave it there. It’s better then if I’m on my own; if I’m out of the kitchen and someone else spills something and doesn’t wipe it up, that’s a big risk. If you drop anything, you pick it up straight away. I do tend to keep the floor area clear.”

Another aspect some people mentioned is that living on their own, they don’t tackle tasks that they consider risky, because there is no one else there to ensure that they are alright, or if something goes wrong.

Use of lighting

Focus group participants discussed the desirability of having adequate levels of natural light during the day. It was also agreed that artificial light should be of a good standard, for use on dull days and at night, in order to reduce risk of falling. Long-life bulbs were discussed, provoking mixed reactions. A number of respondents thought long-life bulbs might be safer than ordinary bulbs, as they need to be changed less often. Others thought that they were too ‘dim’.

It was felt that lighting could sometimes increase the risk of falling in the home due to ‘optical illusions’, e.g. shadows. This was also a problem in combination with the colour of the floor surface:

“Darker carpets are better – they show less muck! But they make the room darker, which isn’t good as you get older and get visual problems. You see the floor but see it differently.”

It was understood by the participants that having sufficient lighting in the home was an important factor in reducing the risks of falling. Nevertheless, a proportion of the sample admitted that they often ‘don’t bother’ switching on a light when moving from one room to another, as they are able to manage without it. This was a common occurrence during the night, specifically in the bedroom and bathroom areas. Other explanations for not using the light at night included not wanting to disturb other people, already being adapted to the dark conditions, not considering putting the light on, completing familiar tasks and saving money. Some participants thought that they were actually more likely to have an accident if they use the light.

External lights outside the house that come on with movement were deemed to be advantageous, and it was thought that their use reduces the risk of falling, for example, tripping outside the front door whilst searching in a bag for keys, tripping on uneven surfaces etc.

Equipment and modifications in the home environment

Some of the participants had had changes made to their homes, including extra handrails on stairs and around the home, rails next to the bath, a board at the end of the bath to sit on, walk-in (ensuite) showers, and special chairs:

“I have an ancient parent and I had handrails put all round her bath. I tried it out and thought it was great – I think we ought to have them in showers as well.”

Fall alarm devices were perceived to be valuable, allowing a person to summon help in the event of a fall. However, none of the participants actually use such a device.

3.3.3 Behaviour Affecting Individual Capability

Age-related factors

There were numerous reports from the focus groups of how specific age-related factors, including poor vision, hearing, balance, muscle strength, reaction time and forgetfulness, amalgamate to make older people more at risk from falls in the home than other age groups. There was mention that some conditions can become increasingly poor with age, weather conditions and time of day, e.g. arthritis, and allowances may need to be made for this.

Some people have slowed down due to previous accidents. Health can also have an effect on speed. Some participants commented on this as a positive factor in reducing the risk of falling, because they are paying more attention to their movements:

“I don’t walk as quickly as I used to because I need to use my angina spray & my arthritis limits me too. It makes me think about what I’m doing though.”

Interestingly, hearing loss was reported to affect risk of falling. It was discussed in the groups that a person with a gradual reduction in hearing ability often doesn’t adapt to small gradual changes, and may not realize how much hearing ability has been lost until there is a significant reduction in ability. It was reported that only when the large change in threshold has been noticed will adaptations in behaviour take place, for example, greater concentration on a task:

“I think my hearing affects my risk of falling – noises around you can be misleading, and for example, can cause you to walk into something. You have to concentrate more (as you get older it’s more difficult to concentrate anyway) and so aren’t paying attention to what you’re doing – it can increase risk of falling.”

Spectacles

Adaptation to changes in vision and the procurement and use of spectacles were issues raised on numerous occasions, and the use of inappropriate spectacles was suggested by some members of the focus groups as being an important risk factor in falls among older people. Bifocals were described as ‘taking a long time to get used to’, but ‘once you’ve got used to them they’re fine’. Some people did have difficulties when on steps and stairs. General problems with spectacles that were raised in the focus groups included issues of judgment of distance, adapting to wearing spectacles/a new pair of spectacles, and the frames obscuring the visual field:

“Glasses can take a lot of your judgment away – you lose the exact size of things – your brain adapts but before it has, I think it can have an effect on the way you perceive things, e.g. height of steps etc.”

As far as wearing their spectacles was concerned, the majority of the sample wore them as necessary and could see problems arising if they did not. However, others removed their spectacles on purpose during particular tasks because they thought that they were safer without them:

“I sometimes take my glasses off in the house – I can see things near better, like when I’m looking at the floor, even though I’m very short sighted – I feel safer.”

The sample thought that a lack of regular eye checks could increase risk of falling. Cataracts were also mentioned as being a ‘problem’ that often occurs with old age, affecting risk of falling because one ‘can’t see distance or depth very well’.

Health and well-being

General health and well-being were thought to affect the risk of falling, and the implications of dizzy spells and blood pressure were discussed. Other issues were also raised in relation to age and falling, including not raising one’s feet efficiently leading to tripping.

The participants thought that exercising was beneficial in reducing the risk of falling as it keeps the body strong and active. The majority of the group undertakes some sort of exercise activity at least once a week, where their health allows, e.g. walking, dancing, keep fit classes and rated activity and exercise as ‘very important in reducing chances of falling’ because ‘you don’t hurt yourself as much if you do have a fall, because you are healthier’. Several of the participants had received advice from the GP regarding exercising. Some was well-received, others were more indifferent:

“The doctor says – don’t reach, bend, kneel – but I think it’s best to keep moving to prevent accidents and falls.”

Possible hazardous effects of medications were recognized by the sample. It was generally appreciated that certain medications and, in particular, mixing them with alcohol, can increase the chances of having a fall.

Mobility

Several members of the sample raised the issue of walking aids. Approximately one third of the participants have mobility problems severe enough that they use one or more walking sticks or a frame to assist their ambulatory balance. Therefore, several issues relevant to such equipment were raised:

“A stick can be a mixed blessing – can be essential but it’s a very clumsy thing too. For example, if it’s raining you’ve got an umbrella to hold up as well as a stick. Could increase your risk of falling.”

The issue of the storing of such a device was also raised as a risk factor. For example, one of the participants commonly left his stick hanging from the back of a chair, creating a trip hazard. The points were also raised that such equipment isn’t always used when required, and the wrong equipment could be used, factors which could contribute to a fall.

Concentration

The consensus was that with age, attention span reduces and if you are not concentrating on what you are doing you have a higher risk of falling.

Tiredness was thought to be a factor in increasing the risk of falling, due to a reduction in the ability to concentrate. Many of the participants manage to combat this problem with the use of a siesta as ‘a rest revitalizes the batteries!’.

Clothing and footwear

Long clothing such as dressing gowns, were mentioned as being a risk for falling, particularly on steps and stairs, due to the risk of tripping on a hem. Although more of an issue outside the home, heels were also declared to be a source of risk, particularly if one is not used to wearing them. However, those females that have always worn them feel more comfortable and safe in heeled shoes. Very few participants moved around the house wearing socks or with bare feet, apart from at night time. One participant reported ‘falling down stairs in stocking feet’, and the general consensus was that ‘wearing just socks is asking for trouble’. Footwear was a prominent topic of discussion throughout the groups. Generally, it was found that footwear that fits well and which allows proper grip and feeling on the floor surface, were qualities sought by the group. However, several of the sample still wore footwear that was ‘undesirable’. Slippers were mentioned, with concern raised with regard to risk of slipping even when slippers are not that old. Many participants also wear their indoor slippers to ‘nip’ out into the garden, an action that was considered risky. Some participants combat this by wearing ‘slippers that have walking out soles (hard, grippy soles) on them’:

“Older people wear slippers – those that are getting old on the bottom get slippery, although they look fine on the top. They don’t last very long. They’re the last things you take off before you go out and the first thing you put on when you get back.”

Some participants decide to change their slippers when they are completely worn out and not before, even if they are 'slippy', simply because they are so comfortable. Another problem reported with old slippers is that 'the bottom sometimes sticks on the floor and makes you unsteady'.

Confidence

Participants were asked if they worried about having a fall. There were some individuals among the group who were concerned for their safety, but the majority indicated that it was not something that they had thought about. The people that were more worried about falling tended to be those people that lived on their own, due to the fact that they worried about not being found after a serious fall. It was recognized in the discussions, however, that a fall could result in not only a serious physical injury, but also have psychological consequences, affecting personal confidence and quality of life.

It was apparent amongst the sample that after someone has suffered a fall, they often lose confidence in their abilities. It was suggested by some members of the sample that this in turn can increase one's likelihood of having a fall:

"Since my wife had her fall, she's become a lot less confident. In a way I think that she's now more likely to have a fall. There's that utter carefulness, if you think about things too much."

Sociological issues

The issue of social class with regard to risk of falling was raised. It was generally felt that if a person could afford to employ someone else to do a 'risky' task, then they would do. However, if this help could not be afforded, it was felt that the person would have an increased chance of having a fall, because they would continue to do the activity:

"People that can afford to have odd-job men in do, but people who can't afford end up in trouble because they do things themselves."

The issue of ‘begrudging’ paying out money for tasks that one had previously been able to complete successfully, and can ‘nearly’ still complete, was also raised. Some participants were unhappy allowing even friends and relatives to complete tasks that they could ‘almost’ manage.

3.3.4 Advice on falling

None of the participants had received any advice on falling prior to the meetings. The participants were all positive about the tips given in the DTI Slips, Trips and Broken Hips and Safety on the Stairs brochures, and thought that they were useful. Some people thought that they were common sense; others announced that the session had made them think about the risks of falling, which they hadn’t done before, and believed they would approach their lifestyle in a different way in the future now that they were aware of the risks. It was generally agreed that prevention is very important to reduce the number of falls among older persons.

3.4 Key Points

- When they take the time to think about the issues, older people are aware of and are able to recognize many of the fall hazards in the home. Common examples that are recognized include rugs, clutter and pets.
- Issues have been raised with regard to design of equipment, e.g. ovens, cleaning equipment, etc. suggesting design opportunities for reducing fall risks.
- The design and choice of footwear, particularly slippers, do not always seem to be appropriate among the sample of focus group participants. There may be scope for safer and more practical footwear that also has some aesthetic appeal.
- Equipment intended to ameliorate the effects of ageing can actually introduce hazards that increase the risk of falling, e.g. walking aids.
- It is suggested that the sociological conditions of an individual can have an effect on their fall risk and on their perceived safety in the home.
- Visitors to the home may increase the presence of hazards in the environment.

- As found in previous research, the characteristics of ageing add to the risk of falling in the home. The contribution of hearing loss perhaps has not been recognized as a risk factor.
- Many older people engage in dangerous acts, sometimes knowingly, e.g. climbing ladders.
- Sometimes relatives and friends can influence behaviour, and have a positive effect on reducing the risks taken in the home. However, this is dependent on the attitude of the individual concerned. Some individuals appear resistant to heeding such advice.
- A minority of focus group participants had made modifications to their homes prior to the meetings, although a majority attending indicated interest and willingness to make changes that would improve their safety with regard to falling.
- None of the participants in this study recalled receiving any advice on fall prevention.
- The DTI brochures were judged to be informative and interesting, perhaps containing some 'common sense', but nonetheless useful.

3.5 Summary

The focus groups have identified the risks and hazards in the home environment of a sample of thirty people. The study has resulted in some useful and interesting qualitative information, about how older people use and move about their homes. Behaviours that seem likely to increase risk of falling in the home have been identified. However, this study does not assist in quantifying the risks and hazards in the home. This will be completed in the next stage of the research, with the use of an interview and home environment survey.

4 Home Interview Survey

4.1 Aims

The aim of this interview survey was to collect initial information on patterns of behaviour around the home likely to affect risk of falling, specifically to collect data on:

- Participants' interaction with their home environment that may affect risk of falling
- Things older people do to maintain or modify their home environment which have implications for risk of falling
- Behaviour affecting individual capability
- Knowledge of factors affecting fall safety
- Extent to which knowledge influences behaviour
- Constraints and obstacles to modifying behaviour and environment

4.2 Method

Semi structured interviews were conducted with 177 older people (150 households), aged 65 – 99, in their own homes. Participants were recruited through existing subject lists held by the researchers and through contacts within the local community. Recruitment approaches included contact with local community groups within Leicestershire, Nottinghamshire and Lincolnshire, as well as targeting the University of the Third Age (Charnwood, Loughborough, Leicester, Nottingham); Charnwood Council for Voluntary Service; Community Voluntary Service, Leicestershire; Charnwood Racial Equality Council; Leicestershire Housing Association; and The Quaker Housing Association, Leicester. The local media (radio, newspapers) was also approached and notices were placed at local hospitals, doctors/dentists surgeries, leisure centers, shops and meeting venues for recruitment purposes.

Participants were sampled according to age and gender using estimated population figures from the UK, and according to their accommodation. Properties were selected by both age and type of housing, using national estimates of housing stock. The research attempted to achieve a quota sample.

Loughborough University Ethical Advisory Committee approval was sought and obtained prior to commencing the research. The interviews involved detailed discussion of different areas of the home, with regard to specific risk factors, and the interviewees' fall history. In addition, standard anthropometric dimensions of interviewees were recorded, along with other measurements including grip strength, ability to get off a stool without using hands, spectacle wear and measures of visual acuity and depth perception. See Table 4.1 for interview schedules. Full details of methods and questionnaires are provided in Appendix 1.

Interviewees were briefed both verbally and in writing about the study prior to participation. They were informed that the interviews would consider falls in the home (including the garden), examples of falls, and risk factors and safety issues that might be involved. However, they were not given any further information, to avoid leading responses in any particular direction. Each interview lasted approximately two hours, with all interviews conducted by the same researcher. All interviewees provided informed consent.

Statistical analysis used χ^2 tests for cross-tabulation calculations and Pearson and Spearman correlation coefficients for assessing interval/ordinal data associations, as appropriate. Qualitative interpretation was also used in conjunction with quantitative evaluation.

Table 4.1: Interview Schedule

Questionnaire	Content	Basis for inclusion	Developed by
Participant information <i>structured interview</i>	<ul style="list-style-type: none"> gender date of birth conditions affecting vision general medical conditions prescribed and non-prescribed medications 	basic information, general health and well being	Loughborough University
Behaviour Questionnaire <i>semi-structured interview</i>	<ul style="list-style-type: none"> how do participants behave in the home that might affect their risk of falling, e.g. home maintenance, hurrying, clutter perception of risk other issues including: footwear, alcohol consumption, behaviour of pets 	information on behaviour; assessment of relationship between knowledge and behaviour	Loughborough University
Modifications to safety and behaviour	<ul style="list-style-type: none"> changes in fall related behaviour and safety use of aids and equipment receipt of previous fall safety advice 	information on behaviour and safety changes; assessment of relationship between knowledge and behaviour	Loughborough University
Falls in the home <i>semi-structured interview</i>	<ul style="list-style-type: none"> history of falls since age 65. 	examination of differences in behaviour and attitudes between 'fallers' and 'non-fallers'	Loughborough University
Ability to carry out daily activities <i>structured interview</i>	<ul style="list-style-type: none"> participants' ability to carry out a range of daily activities 	measure of self-assessed functional ability	Modified from Barthel Index
Physical and physiological measurements	<ul style="list-style-type: none"> height, weight, size of feet functional ability ('grip strength', 'rise from stool') vision (acuity, stereopsis) 	basic information on participants and their functional ability	Loughborough University
Home Environment Checklist <i>survey undertaken by interviewer</i>	<ul style="list-style-type: none"> design and condition of floor area including objects/items on floor design of furnishings and environment presence of assistive aids, e.g. grab rails lighting provision 	objective assessment of home environment; comparison with participants' own assessment of their behaviour	Loughborough University

4.3 Results

The sample comprised 177 individuals, 47% of whom lived on their own and 53% who cohabited.

4.3.1 Information about the sample population

Characteristics of accommodation

The median age of property was 40 years, with properties ranging from 3 to 110 years old. See Table 4.2 for further household characteristics. Just over one quarter (26%) of the sample lived in bungalows, compared to 10% of the UK population (DETR, 2002).

Table 4.2: Characteristics of accommodation

Type of Accommodation	House types in sample (%)	House types in UK (%) **
Detached	36	21
Semi-detached	39	34
Terraced	5	27
Flat	16	14
Other types of properties (e.g. bed sit)	4	4

** data from DETR Survey of English Housing (England 1999/2000)

Characteristics of population

The mean age of participants was 76 years (standard deviation 7.3). The sample was split 73% female, 27% male. Details of participants including personal details, functional and visual abilities are presented in Figures 4.1 – 4.4 and Tables 4.3 – 4.4. Although a wide age range of participants was recruited it should be acknowledged that it was not possible to attract members of the public who were so frail that they were unable or unwilling to participate in the study.

Within the sample, 8% of interviewees belonged to an ethnic minority group, compared to 5.5% of the UK population and 6.7% of the population in the Midlands (ONS, 1991).

The ACORN Profiling method was used to assess socioeconomic status, by using postcode data. The range of socioeconomic groups within the sample was generally good, although slightly biased towards affluence compared to the UK population data, Figure 4.5.

Figure 4.1: Age frequencies amongst participants

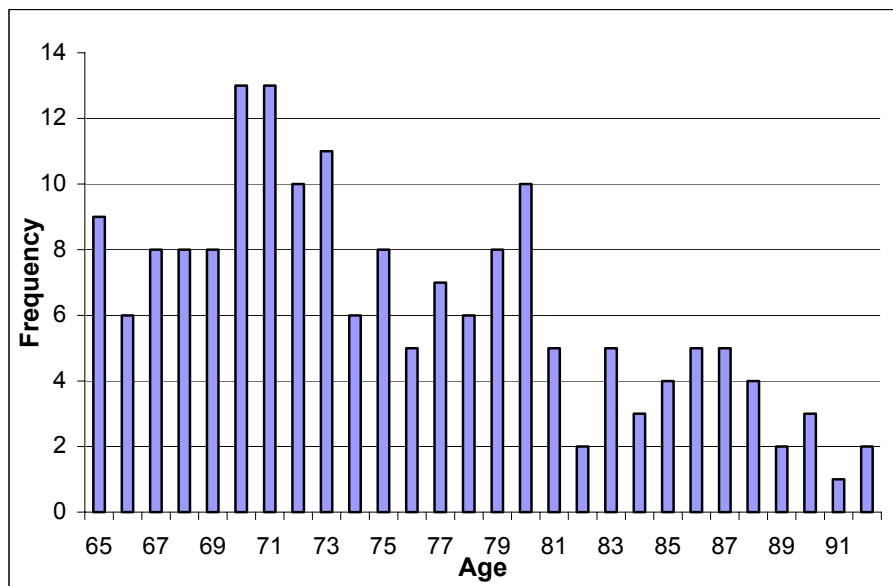
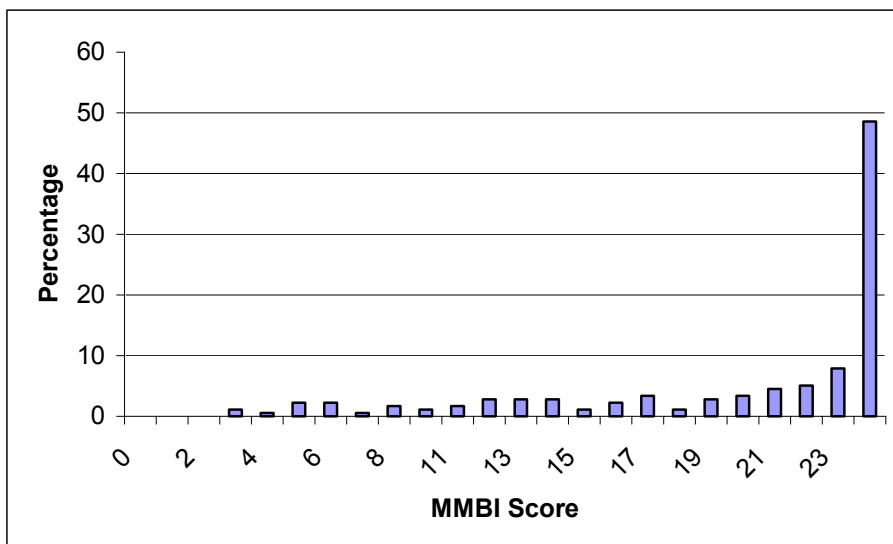


Figure 4.2: MMBI Functional ability score



The scatter plot of the relationship between age and MMBI score suggests a linear negative relationship between the two variables. The lower the MMBI score, the less able the individual. There is a significant negative relationship between age and MMBI score ($r = -0.392$, $p < 0.001$). Therefore, older participants have lower MMBI scores.

Figure 4.3: The relationship between age and MMBI

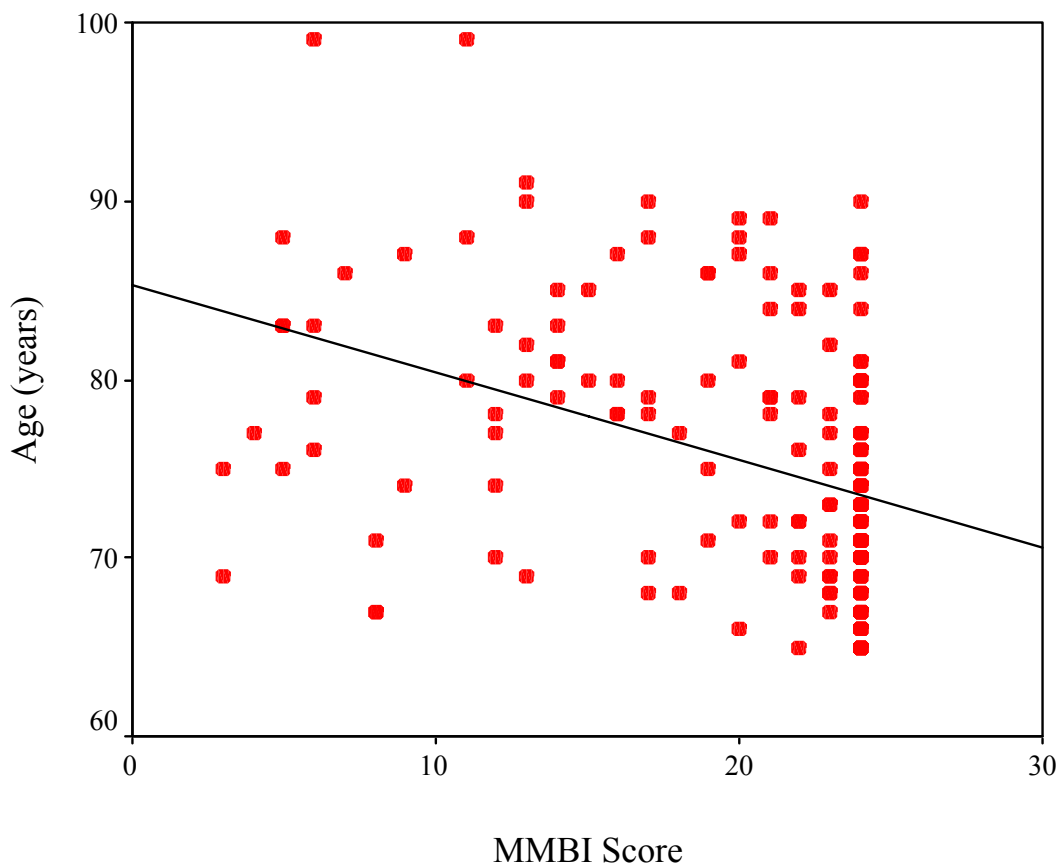


Table 4.3: Body mass index (weight [kg]/height [m²])

	All participants (%)	Male (%)	Female (%)
Low (<20)	4	4	4
Normal (20 – 25.9)	43	42	44
High (26 – 29.9)	39	39	39
Obese (>30)	14	15	13
BMI (all participants)	Mean 25	Standard deviation 7.5	Range 18-39

Table 4.4: ‘Grip strength’ for preferred hand (average of 4 readings, N = Newtons)

	Male (N)	Female (N)
Mean	273	157
Standard deviation	83	62
Minimum	90	0
Maximum	400	375

Figure 4.4: Get up from a stool test

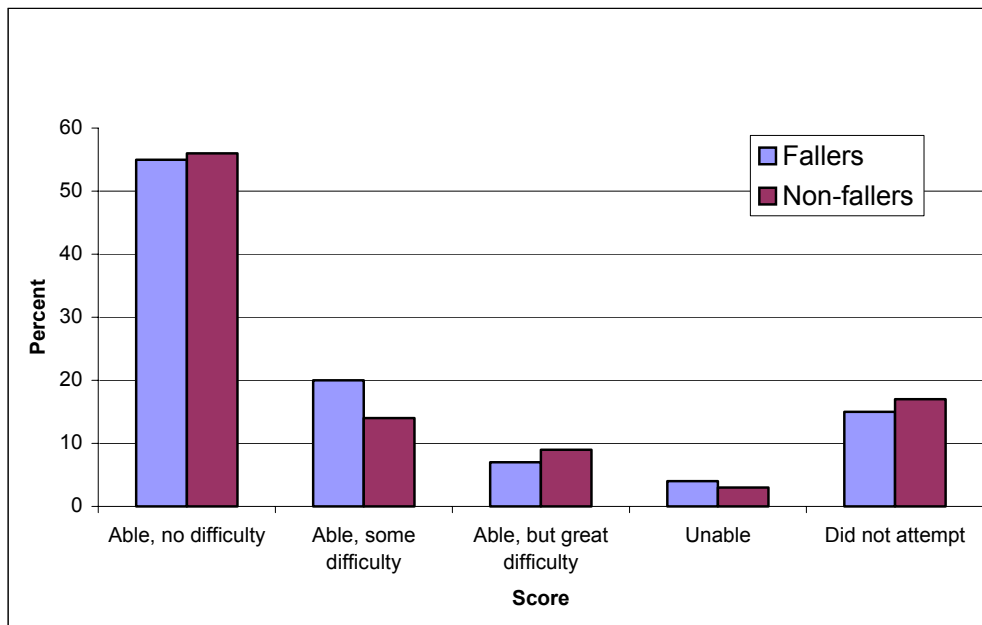


Figure 4.5: Socioeconomic status (ACORN Profiling)

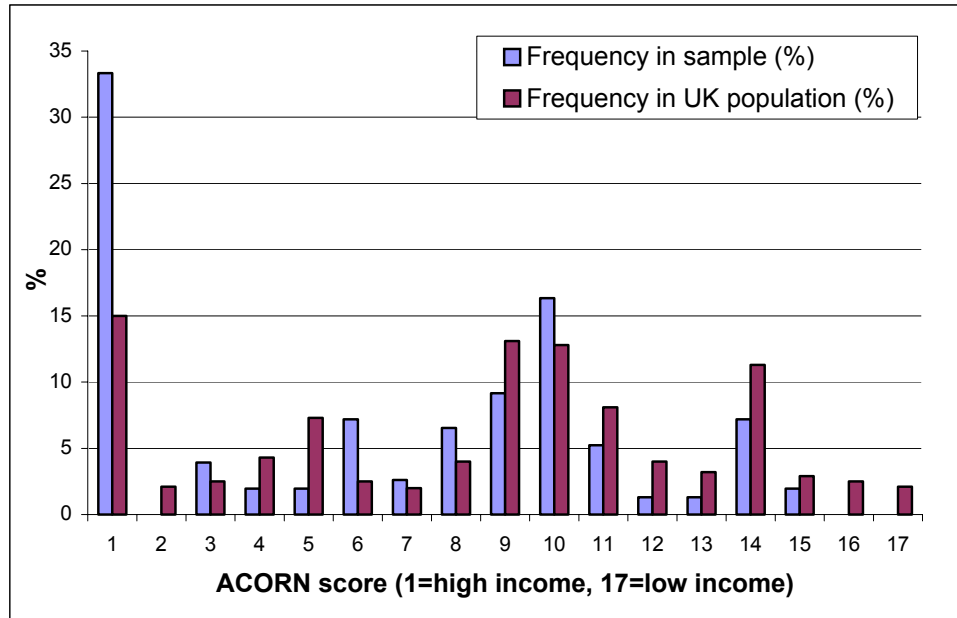


Figure 4.6 shows the relationship between the key physical abilities, age and fall history. The key points include:

- The lower the MMBI score, the less able the individual
- There was no difference in MMBI with gender
- There was an decrease in MMBI with increasing age ($p < 0.001$)
- A participant with a higher MMBI was likely to have higher grip strength ($p < 0.001$), be able to rise from a stool more easily ($p < 0.001$), and be able to stand on one leg for a longer period of time ($p < 0.001$), than a participant with a lower MMBI score.
- Participants who used a walking aid were more likely to have lower MMBI scores ($p < 0.001$)

Figure 4.6: Physical Assessment Matrix

	Increasing MMBI score	Increasing grip strength	Increasing ability to rise from stool	Increasing ability to balance on 1 leg	Increasing age	Increased number of previous falls
Increasing MMBI score	X					
Increasing grip strength score		X				
Increasing ability to rise from stool			X			
Increasing ability to balance on 1 leg				X		
Increasing age					X	
Increasing number of previous falls						X

Binocular Visual Acuity

Visual acuity was tested at a distance of 2.5 metres, with scores converted to conventional notation. A high proportion of participants (88%) had uncorrected visual acuity worse than 6/12, see Figure 4.7. (In the UK, the visual acuity requirement for driving is approximately 6/15 or better.)

Figure 4.7: Binocular visual acuity

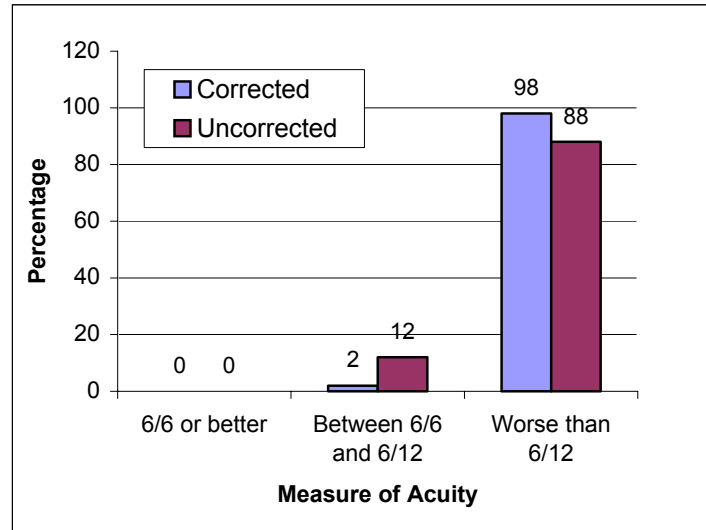
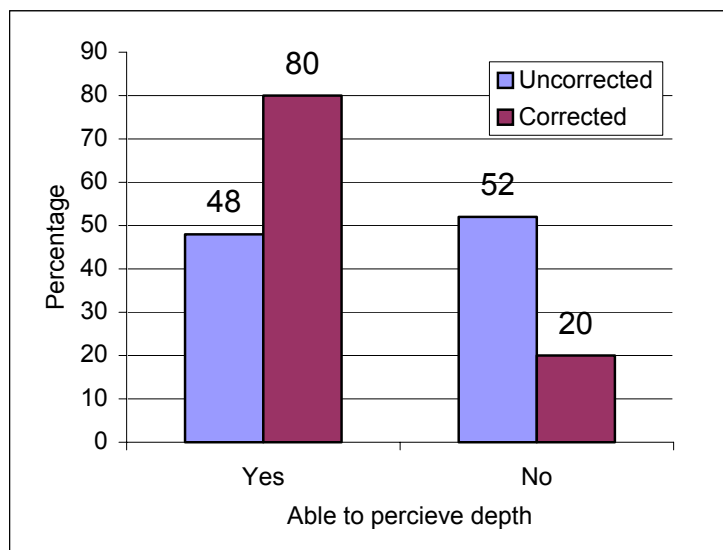


Figure 4.8: Depth vision



4.3.2 Behaviour

The results have been considered under three categories, using the model developed for the stairs research (Hill *et al.*, 2000). The model describes risk of falling in terms of the way individuals interact directly with the environment, as a consequence of actions which modify the environment, or through behaviour affecting individual capability.

Direct interaction with the home

Patterns of use

People generally reported using most areas of their home, although, as might be expected, participants living in properties with multiple living or bedroom areas, rarely used all of the rooms in an equal manner, favoring some for storage purposes only (93%). Within the population visited, it was not apparent that any of the participants had ‘migrated’ to only one room within the home, a pattern of behaviour that has been suggested might occur. Some of the participants (19%) reported not using their gardens often, due to mobility and balance problems, combined with a difficult environment and access, and/or a general fear of falling, Figure 4.9. It was reported by 17% of the sample that loft and attic areas tended to be avoided for the same reasons.

Figure 4.9: Fear of falling

“I avoid going in the garden, as there are lots of changes in level and nothing to hang onto.”

Participant143

Carrying

Among those interviewed, 64% reported that they carry objects around the home, and 64% felt there could be a risk involved in such a practice. Although there was some overlap here, the higher the perceived risk of falling, the less likely a person was to carry objects ($p < 0.001$). Reasons for feeling at risk included not being able to see where one was going resulting in a trip, or due to a reduction in stability and balance. Items that were discussed as problematic included furniture, shopping bags, and piles of washing. Table 4.5 illustrates the associations with carrying and scores of functional ability.

Pets

Of participants in this survey, 16% had pets. Of these people, a third (32%) reported issues of concern regarding their pets and fall risk. Reasons for increased fall risk included difficulties seeing pets leading to increased trip hazards, general pet clutter and pets under foot, Figures 4.10 – 4.11. There were no associations between age or any of the indicators of functional ability and pet keeping.

Table 4.5: Factors associated with carrying

	Effect	Significance
Increasing age	negative correlation	p<0.001
Gender	none	ns
Increasing MMBI score	positive correlation	p<0.001
Rise from stool ability	positive correlation	p<0.001
Grip strength	positive correlation	p<0.001
Ability to balance on 1 leg	positive correlation	p<0.001
Deteriorating health	none	ns
Use of walking aid	negative correlation	p<0.001
‘Fallers’	none	ns
Other occupants	none	ns

Figure 4.10: Pets

“The cat sits next to my feet when I’m cooking meat. I have to keep looking about for her...”

Participant 91a

“I have a small dog... I never take him to older friends’ homes as he can be a trip hazard.”

Participant 29

Figure 4.11: Examples of pet risk



Housework and Cleaning

86% reported that they clean/do housework around the home, and 37% felt there was risk involved in performing these tasks. The higher the perceived risk of falling, the less likely a person was to complete housework ($p<0.001$). There was a significant positive relationship between MMBI and housework ($p<0.001$), and, as might be expected, people who did not use a walking aid were more likely to undertake housework around the home than those who used an assistive device ($p<0.001$), Table 4.6.

Table 4.6: Factors associated with cleaning and housework

	Effect	Significance
Increasing age	negative correlation	$p<0.001$
Gender	none	ns
Increasing MMBI score	positive correlation	$p<0.001$
Rise from stool ability	positive correlation	$p<0.001$
Grip strength	positive correlation	$p<0.001$
Ability to balance on 1 leg	positive correlation	$p<0.001$
Deteriorating health	none	ns
Use of walking aid	negative correlation	$p<0.001$
'Fallers'	none	ns
Other occupants	none	ns

Hurrying

In our sample, 66% reported rushing around the home to some extent, although 94% felt there was risk involved with this. People with a higher MMBI score and those who did not use a walking aid were more likely to report hurrying around the home than those who were more frail ($p<0.001$), Table 4.7.

Table 4.7: Factors associated with hurrying

	Effect	Significance
Increasing age	negative correlation	$p<0.001$
Gender	none	ns
Increasing MMBI score	positive correlation	$p<0.001$
Rise from stool ability	positive correlation	$p<0.001$
Grip strength	none	ns
Ability to balance on 1 leg	positive correlation	$p<0.001$
Deteriorating health	none	ns
Use of walking aid	negative correlation	$p<0.001$
'Fallers'	none	ns
Other occupants	none	ns

Gardening

The majority of the sample population (72%) reported being active gardeners, and 45% of the sample thought that there was at least some risk of falling involved in gardening, although no statistical relationship was found between perceived risk of falling and extent of gardening activities. There was no association between age or gender and gardening, although, as might be expected, people who used a walking aid or had a lower MMBI score were less likely to undertake gardening activities than those individuals who were fitter ($p<0.05$ and $p<0.001$ respectively), Table 4.8.

A number of households had modified their garden in some way (10%). Changes were often made to 'make life easier' for the occupant(s), although sometimes this introduced further problems. See Environmental Risk Factors section.

Table 4.8: Factors associated with gardening

	Effect	Significance
Increasing age	negative correlation	p<0.001
Gender	none	ns
Increasing MMBI score	positive correlation	p<0.001
Rise from stool ability	positive correlation	p<0.001
Grip strength	positive correlation	p<0.001
Ability to balance on 1 leg	positive correlation	p<0.001
Deteriorating health	negative correlation	p<0.05
Use of walking aid	negative correlation	p<0.001
'Fallers'	none	ns
Other occupants	none	ns

Home Maintenance

Of the sample, 54% of individuals reported changing their own light bulbs and 75% thought the task entailed some risk of falling. Participants, who didn't change light bulbs, felt there was risk involved (p<0.001).

As MMBI scores decreased, people were less likely to change light bulbs (p<0.001) and women were less likely than men to do this task (p<0.001). As might be expected, people who used a walking aid (p<0.001), or had lower functional abilities (grip strength p<0.001, balance ability p<0.001, and rise from stool ability p<0.001), were less likely to undertake home maintenance activities than those individuals who were fitter or more mobile, Table 4.9.

Table 4.9: Factors associated with changing light bulbs

	Effect	Significance
Increasing age	negative correlation	p<0.001
Gender	(male) association	p<0.001
Increasing MMBI score	positive correlation	p<0.001
Rise from stool ability	positive correlation	p<0.001
Grip strength	positive correlation	p<0.001
Ability to balance on 1 leg	positive correlation	p<0.001
Deteriorating health	negative correlation	p<0.05
Use of walking aid	negative correlation	p<0.001
'Fallers'	none	ns
Other occupants	none	ns

The design of light fittings was an interesting point raised by several interviewees. Some fittings require tools to remove the casing so that access to the light bulbs could be attained. This was reported to result in several trips up and down a stepladder or chair, thus increasing the risk of having a fall. Some interviewees had recognised this risk and had modified the fittings so that they could change the light bulbs easily (Figure 4.12).

Figure 4.12: Light fitting design



Undertaking ‘do-it-yourself’ (DIY) activities was fairly commonplace amongst the sample; 43% engaged in DIY although 65% of the total sample thought there was some risk of falling involved. Participants who felt most at risk of falling whilst completing DIY activities were least likely to perform the activity ($p < 0.001$). Intraindividual variation means there would rarely be no overlap. Individuals with lower physical abilities and lower MMBI scores were less likely to complete DIY activities ($p < 0.001$ for MMBI, 1 leg balance, grip strength and rise from stool test), Figure 4.10. Men were more likely than females to undertake DIY ($p < 0.001$) and there was a negative association with age ($p < 0.001$) and DIY activity. Participants with lower MMBI scores were also less likely to engage in DIY ($p < 0.001$). The main reasons for discontinuing DIY activities are described in Table 4.11.

Table 4.10: Factors associated with ‘DIY’

	Effect	Significance
Increasing age	negative correlation	p<0.001
Gender	(male) association	p<0.001
Increasing MMBI score	positive correlation	p<0.001
Rise from stool ability	positive correlation	p<0.001
Grip strength	positive correlation	p<0.001
Ability to balance on 1 leg	positive correlation	p<0.001
Deteriorating health	negative correlation	p<0.05
Use of walking aid	negative correlation	p<0.001
‘Fallers’	none	ns
Other occupants	negative correlation	p<0.05

Table 4.11: Reasons for discontinuing DIY activities (multiple responses)

Concerns over safety, e.g. dizziness, reduced mobility, loss of energy	50%
Loss of confidence	25%
Takes too long	10%
Partner deceased	3%

The design of stepladders was discussed by several of the participants. Some opinions were voiced that stepladders should be sturdy wood and ‘heavy looking’, although other participants preferred to use light aluminium steps that were easy to move about the home. The issue of storage was also raised. As one might expect, if stepladders were stored in the garage or the garden shed, a person was far more likely to stand on a chair or stool to complete a job quickly, instead of going to fetch more appropriate equipment.

Table 4.12: Factors associated with use of stepladders

	Effect	Significance
Increasing age	negative correlation	p<0.001
Gender	none	ns
Increasing MMBI score	positive correlation	p<0.001
Rise from stool ability	positive correlation	p<0.001
Grip strength	positive correlation	p<0.001
Ability to balance on 1 leg	positive correlation	p<0.001
Deteriorating health	negative correlation	p<0.05
Use of walking aid	negative correlation	p<0.001
‘Fallers’	none	ns
Other occupants	negative correlation	p<0.05

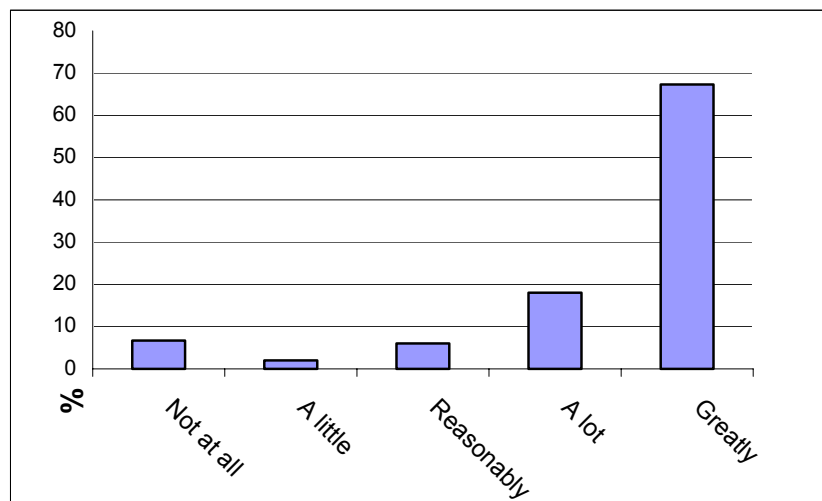
Behaviour affecting the home environment

Environmental Risk Factors

Objects left on the floor

The interviewees were asked whether they leave objects on the floor (including general household clutter and rugs), what the objects might be, the frequency of such an event and whether they thought it played a role in fall risk. The most frequent items left on the floor included footwear, bags, newspapers and general household ‘clutter’.

Figure 4.13: Do objects left on the floor affect risk of falling?



When asked, over 90% of participants thought that leaving things on the floor would increase the risk of having a fall (see Figure 4.13). However, the majority (80%) of participants admitted to having some amount of clutter in their homes, although many had reasons, as described in Figures 4.14 – 4.15. The main reasons given for objects to be left on the floor are described in Table 4.13.

Table 4.13: Reasons for objects to be left on the floor

Items are on the floor but they are left out of the way	27%
Just shoes / bags	24%
Only newspapers / magazines	15%
Forgetfulness / laziness	12%
Small rugs	12%
Pets & pet items	3%

Figure 4.14: Examples of clutter



Figure 4.15: Comments regarding clutter in the home

“I always keep the pathway for walking clear of clutter...things left around the edge of a room are ok...”

Participant 27

“It’s dangerous to leave things lying about on the floor...you could trip. My husband’s very wobbly so I’m very careful to keep everything tidy...”

Participant 5a

There was no association between age or any of the indicators of functional ability and pet keeping (see Table 4.14). The only effect was found between cohabitation and clutter; the findings suggest that as the number of occupants in a home increases, the likelihood of clutter being reported in the home decreases. See Table 4.15.

Table 4.14: Factors associated with ‘clutter’

	Effect	Significance
Increasing age	none	ns
Gender	none	ns
Increasing MMBI score	none	ns
Rise from stool ability	none	ns
Grip strength	none	ns
Ability to balance on 1 leg	none	ns
Deteriorating health	none	ns
Use walking aid	none	ns
‘Fallers’	none	ns
Size of accommodation	none	ns
Pets	none	ns
Other occupants	negative correlation	p<0.01

Table 4.15: Reasons for not having ‘clutter’

Risk of falling	52%
Tidiness	26%
Can’t bend down – can’t get to objects	9%
Vision – will trip over objects	6%
Mobility – can’t avoid objects easily	2%
(Other	5%)

Floor surface

Respondents discussed types and changes in floor surface and level. Colour and pattern were recognised to be issues for camouflage effect. For example, a number of households visited had protective squares of original carpet over the fitted carpet as demonstrated by Figure 4.16 and Figure 4.11.

Figure 4.16: The camouflage effect demonstrated by overlaid protective carpeting



Figure 4.17: 'Garden clutter'



Floor surfaces in the garden were perceived to be a particular problem, due to changes in level, surface, texture, with the presence of uneven ground, slopes, and steps. Ice, frost and rain were common reasons for avoiding entering the garden because of a perceived increased risk of falling. 'Garden clutter', including plant pots and hosepipes, was also an issue, as demonstrated in Figure 4.17. In combination with deteriorating eyesight and a reduced level of mobility, whilst carrying a garden appliance for example, it was thought that these objects could be dangerous.

As discussed under ‘Gardening’ 10% of households had made changes to the garden. Modifications had often been made to ‘make life easier’ for the occupant(s), although this sometimes resulted in further problems arising. An example is shown in Figure 4.18; the occupant had had the lawn replaced with slabs and gravel so that she no longer needed to cut the grass. She made this decision because she was finding it difficult to carry the lawn mower from the shed to the lawn and then to complete the task. On some occasions, however, the landscaping of the garden led to different problems. The occupant had stood on the paving and reached up to the line to hang out her washing, and then stepped backwards and tripped.

This demonstrates that modifications can easily cause further problems if they are not thought through properly.

Figure 4.18: Garden modification



Use of lighting

When asked, only 38% of interviewees thought that there might be some risk of having a fall in dark conditions, and only 54% reported that they put the light on when walking around at night time. The findings indicate that as people age and their functional abilities deteriorate, they are more likely to use lighting in otherwise dark conditions. See Figure 4.19 and Table 4.16.

Figure 4.19: Reasons for not putting the light on

“I don’t want to disturb my partner...”

Participant 144

“I can see better in the dark than if I turn the light on...if I do, then I have to wait for my eyes to adjust anyway, and it takes me longer to get back to sleep.”

Participant 13

Table 4.16: Factors associated with use of lighting

	Effect	Significance
Increasing age	positive correlation	p<0.01
Gender	none	ns
Increasing MMBI score	negative correlation	p<0.01
Rise from stool ability	negative correlation	p<0.01
Grip strength	negative correlation	p<0.01
Ability to balance on 1 leg	negative correlation	p<0.01
Deteriorating health	none	ns
Use walking aid	positive correlation	p<0.001
‘Fallers’	none	ns
Other occupants	none	ns

Long life lighting

Of the sample, 40% reported using compact fluorescent long life bulbs. A statistical association was found between functional abilities and whether long life lighting was used (e.g. age, p<0.01; use of walking aid, p<0.01). See Table 4.17. This might be explained by the fact that many of the long life light bulbs had been distributed free of charge through older people’s groups, daycare centres, etc. which are generally attended by frailer individuals.

Table 4.17: Factors associated with use of long life lighting

	Effect	Significance
Age	positive correlation	p<0.01
Gender	none	ns
Increasing MMBI score	none	ns
Rise from stool ability	negative correlation	p<0.05
Grip strength	negative correlation	p<0.01
Ability to balance on 1 leg	negative correlation	p<0.001
Deteriorating health	none	ns
Use walking aid	positive correlation	p<0.01
'Fallers'	none	ns
Other occupants	none	ns

Modifications to the environment and behaviour

Table 4.18 presents details of participants who reported having made changes already, or thinking of making changes in the future, to their behaviour in the home and/or the home environment with regard to fall safety.

Table 4.18: Modifications to behaviour and environment

Have made safety changes to the environment (Grab rails [bathroom, external doorways], white stripes on stairs, removed rugs, life line, long life bulbs)	69%
Have made changes to behaviour (Don't rush/carry items/have clutter/climb)	38%
Would make future safety changes to the environment (Grab rails, garden changes, life line)	44%
Would make future behaviour changes (Get a gardener, take exercise)	1%

In over two thirds of homes (69%), various changes had been made to the environment with the aim of improving safety. These safety changes were prompted due to various reasons, as illustrated in Table 4.19.

Of the 38% of interviewees who reported having made safety changes to their behaviour, these were all reported to be due to physiological deterioration in mobility, strength, balance and coordination.

Table 4.19: Reasons for safety changes to the home

Accommodation designed for older/disabled occupancy	21%
Social services/NHS intervention	12%
Common sense/ease of use	11%
Disabled partner/relative (acquisition of equipment)	8%
Seen at friends' etc. and thought useful	5%
Relatives insistence	5%
Other, e.g. free sample	7%

Table 4.20 presents details of participants who reported knowledge of fall issues, and Table 4.21 presents details of participants who reported using particular fall related products or who might consider using them in the future.

Table 4.20: Source of knowledge for fall issues

Know of a faller (other than self)	23%
Know anyone at risk of falling	<1%
Seen or received any advice on falls	5%

Only 20% of the sample reported using a fall alarm, although 90% of the interviewees reported that they would obtain an alarm when they felt the need. Most of the sample had not heard of hip protectors, although approaching half of the respondents said they would consider wearing them “if necessary”. Bath hoists were not used at all among the participants, although, again, people were receptive to the idea of using them if they would be of benefit.

Table 4.21: Product issues

Use fall alarm	18%
Would use fall alarm	90%
Use hip protectors	0%
Would use hip protectors	41%
Use bath hoist	0%
Would use bath hoist	74%

Behaviour affecting individual capability

Health and Medication

Among the participants in the survey, 13% experienced side effects from prescribed medication that might affect the individual's risk of falling (see Table 4.22). The majority of these people (88%) had been warned of side effects from their medication by their doctor or pharmacist. There was one report of vision being affected by medication, Figure 4.20.

Figure 4.20: Vision affected by medication

“eye drops affect my vision - blurry, stinging, and ingrown eyelashes...”

Participant121

Table 4.22: Medication and side effects

Participants with 1+ health problems related to fall risk	93%
Participants taking 1+ prescribed medications daily	79%
Participants taking 4+ prescribed medications daily	23%
Participants experiencing fall-related side effects from prescribed medication	13%

Vision and Spectacles

The last reported visit to the optician ranged between 1 month and 10 years or more. The median time since the last appointment was 15 months, Table 4.23.

The majority of participants reported wearing their spectacles appropriately in accordance with their prescription. Some 8% (n = 15) of the spectacle wearers in the population reported wearing inappropriate spectacles (e.g. old prescription glasses), Figure 4.21.

Table 4.23: Vision

Eye test in last 2 years	90%
Wear bifocal spectacles	39%
Wear varifocal spectacles	22%
Wear combination of reading and distance spectacles	39%

Figure 4.21: Examples of spectacle use

“I wear my reading glasses for reading, distance glasses for watching the TV and for driving in, and my old prescription reading glasses for housework and gardening. I wear these for most of the time that I’m at home...”

Participant 82

“I wear my old readers for using the computer or watching TV (2/3 yrs old), my half moon readers for reading and sewing, and the varilux for driving and TV too...”

Participant 22a

Problems were reported with spectacles among 17% (n = 30) of participants. These individuals thought that the use of their spectacles increased their risk of having a fall. Problems with bifocals and varifocals were the most common issues raised, including blurriness, double vision, and difficulty in using stairs whilst wearing glasses, Figure 4.22.

Figure 4.22: Example of spectacle problem

“I can't get used to the Varilux - I can't tell where the floor is.”

Participant 24

A further 7% (n = 13) thought that their lenses needed altering, due to changes in vision from cataracts and deteriorating visual acuity, which were common ailments among the sample, Table 4.24.

Table 4.24: Visual problems within sample population (multiple responses)

Any condition(s) that affects vision, e.g. cataracts, glaucoma.	36%
Cataract(s)	25%
Glaucoma	5%
Macular degeneration	2%
Colour defects	2%
Other, e.g. diabetic retinopathy, iritis, watery eyes	10%

Use of walking aids

Within the study group, 32% (n=56) of participants reported using some sort of walking aid within their home. A quarter (n=14) reported that their particular device has caused them problems with regard to risk of falling in the home.

Whilst it was appreciated by interviewees that walking aids are often helpful for balance control and getting around, it was said they are not so appropriate for use with poor coordination and mobility in smaller, more cluttered and less spacious environments within the home. A small proportion of individuals actually abandoned their prescribed walking aids, in favour of using the furniture as a support. If interviewees had mobility problems (e.g. are inclined to use a walking aid), they were more likely to put a light on when moving about at night time ($p<0.001$), Table 4.25.

Table 4.25: Details of population who use walking aids

	Effect	Significance
Increasing age	positive correlation	$p<0.001$
Increasing MMBI score	negative correlation	$p<0.001$
Rise from stool ability	negative correlation	$p<0.001$
Grip strength	negative correlation	$p<0.001$
Ability to balance on 1 leg	negative correlation	$p<0.001$
Deteriorating health	positive correlation	$p<0.01$
Fall history	none	ns

Footwear and Clothing

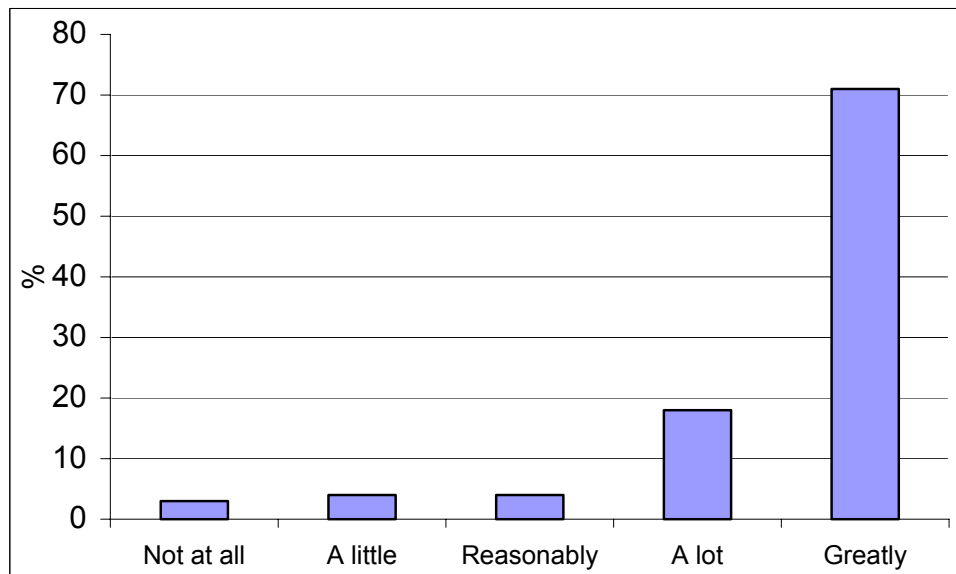
The most often worn footwear around the home (inside and out) were shoes and slippers, as described in Table 4.26. The same footwear was frequently worn in both areas (54% of respondents), reasons for this including laziness (77%), and being unable to easily change footwear due to poor mobility (12%).

Table 4.26: Details of footwear worn for percentage of population

	In the house	In the garden
Shoes	26%	59%
Mule (backless) slippers	13%	10%
Back-filled slippers	43%	21%
Socks	3%	<1%
Sandals	10%	5%
Wellington boots	-	<1%
Walking boots	-	3%
Bare feet	5%	-
Other	<1%	1%

The vast majority of interviewees (97%) thought there was some risk of falling related to footwear being worn, and 71% of the sample thought that the footwear factor was ‘greatly’ associated with risk of falling. See Figure 4.23.

Figure 4.23: Footwear and perceived risk of falling



Reasons for choosing footwear are tabulated in Table 4.27. There were no significant differences between type of footwear worn, fall history, age category, or gender. It was clear that safety of footwear was important to participants; 26% of the sample reporting having changed what they wear due to safety issues. Reasons are given in Figure 4.24.

Table 4.27: Reasons for choosing footwear

Comfort	27%
Safety	44%
Comfort and Safety	29%

Figure 4.24: Examples of footwear use

“I wear mule slippers as I can’t bend down to pull the back of a shoe on...they are risky though...”

Participant 26b

“I don’t feel safe in heels...the heels get caught in things...although, I do think more of comfort than safety...”

Participant 68

Footwear differed among ethnic minority respondents with older Asian adults often wearing flat sandals with limited support around the toe area only, called ‘chumpals’. When questioned, respondents indicated that the use of this type of footwear was well practiced and not perceived to be an issue in falling among the Asian population within this sample.

Although clothing was an issue raised very little by the participants during the interview survey as a concern or factor in fall safety, there were obvious differences in dress between ethnic groups with cultural dress, such as saris, commonplace among Asian respondents.

Exercise

The majority of participants (78%) reported undertaking some form of exercise during the course of a normal week. Reported types of exercise varied between (multiple responses) walking (54%), gardening (45%), and exercise classes (25%), e.g. line dancing, aerobics, yoga, tai chi.

Alcohol and Smoking

Table 4.28: Use of alcohol

Drink alcohol	71%
Mean number of units per week	6
Minimum no. of units per week	0
Maximum no. of units per week	70
Standard deviation	6.5
Avoid if on medication	67%

No relationship was found between gender and the number of units of alcohol consumed in the last week, with similar numbers of women compared to men having consumed alcohol, nor was a relationship found between health and units of alcohol consumed in the last week before interview.

A surprisingly low proportion of the sample population reported to be smokers (8%), although the researcher's impression was of a higher figure. However, a disparity would not significantly affect any data.

Information and Advice on Fall Safety

Only 4% of the sample population (n=7) reported receiving any information or advice on fall safety. Figure 4.25 presents details of origin of the advice.

Figure 4.25: Origin of falls information

“Read something in a magazine”
“Notices up at sheltered housing”
“Over 75s Falls Team visit”
“Taking part in osteoporosis research and saw leaflets - made me be more aware of exercise being important”
“TV campaign” (n=2)
“Seen leaflets at hospital”

Fall History

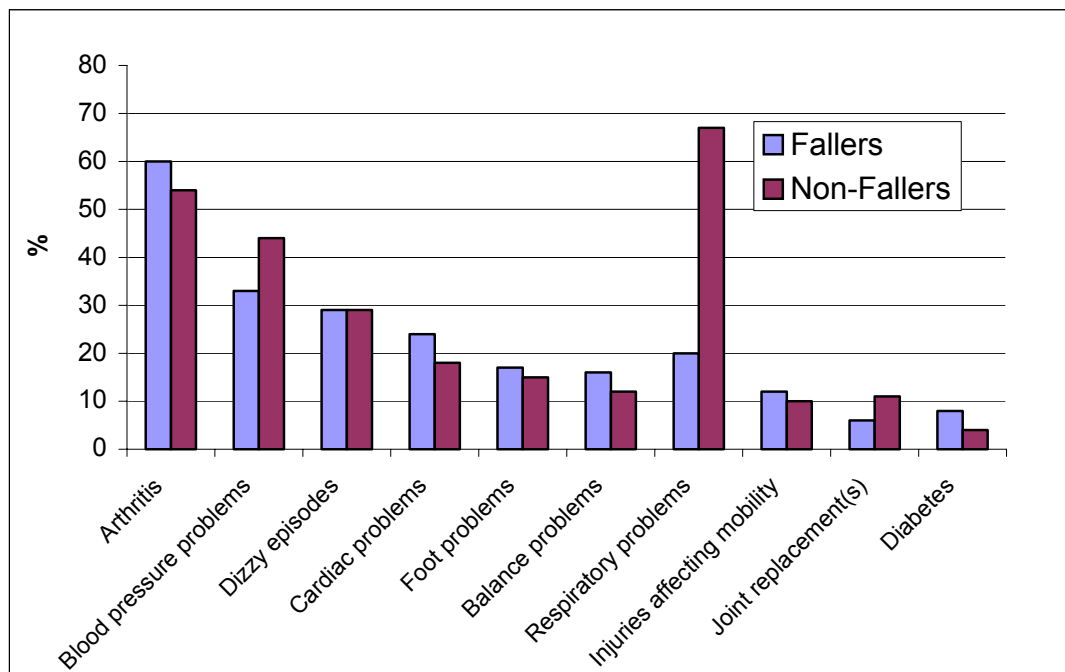
Almost half (48%, n=85) of the participants had fallen in the home at least once in the last 2 years, since the age of 65, and 21% had fallen on two or more occasions in the home. Health problems were common both among fallers and non-fallers, Table 4.29,

Figure 4.26. There were no significant differences between the two groups except for respiratory problems, where non-fallers suffered more from asthma etc. Neither were there any correlations between age or type of accommodation lived in and previous falls.

Table 4.29: Health

	Fallers	Non-Fallers
Have at least 1 health problem related to falling	95%	90%

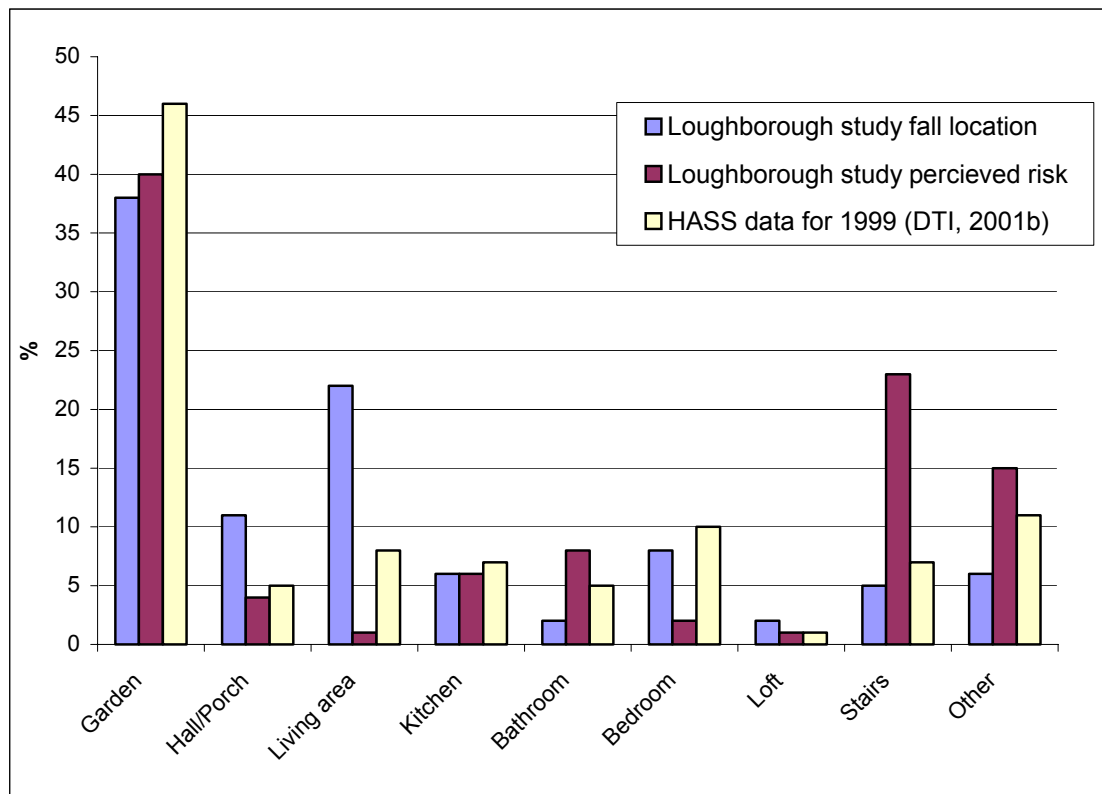
Figure 4.26: Health problems (multiple responses)



Of the most recent fall reported per faller, the most common locations included the garden and the living areas of the home. Figure 4.27 compares the locations where people had fallen in this study with HASS data on fall location for an injured person reporting to hospital A&E department. The figure also shows our respondents' perception of the risk of falling in different areas of the home. It can be seen that while respondents' impressions of the risk of falling in the garden and the kitchen were accurate, they overestimated risk of falling on stairs, whilst underestimating risk of falling in general living areas and bedrooms.

Figure 4.28 compares the behaviours and activities asked about in the interview to demonstrate which ones were felt to be associated with an increased fall risk. Additional activities that were associated by several interviewees included getting out of bed in the morning (dizziness), using the bath/shower (and slipping) and changing the bed sheets (tripping on overhanging blankets etc.)

Figure 4.27: Fall Location and perceived risk



Falls occurred at various times throughout the course of the day. Although 40% of respondents could not recall what time of day their fall occurred, falls appear more common between the hours of 0600 and 1200, Figure 4.29.

Figure 4.28: Perceived risk of falling

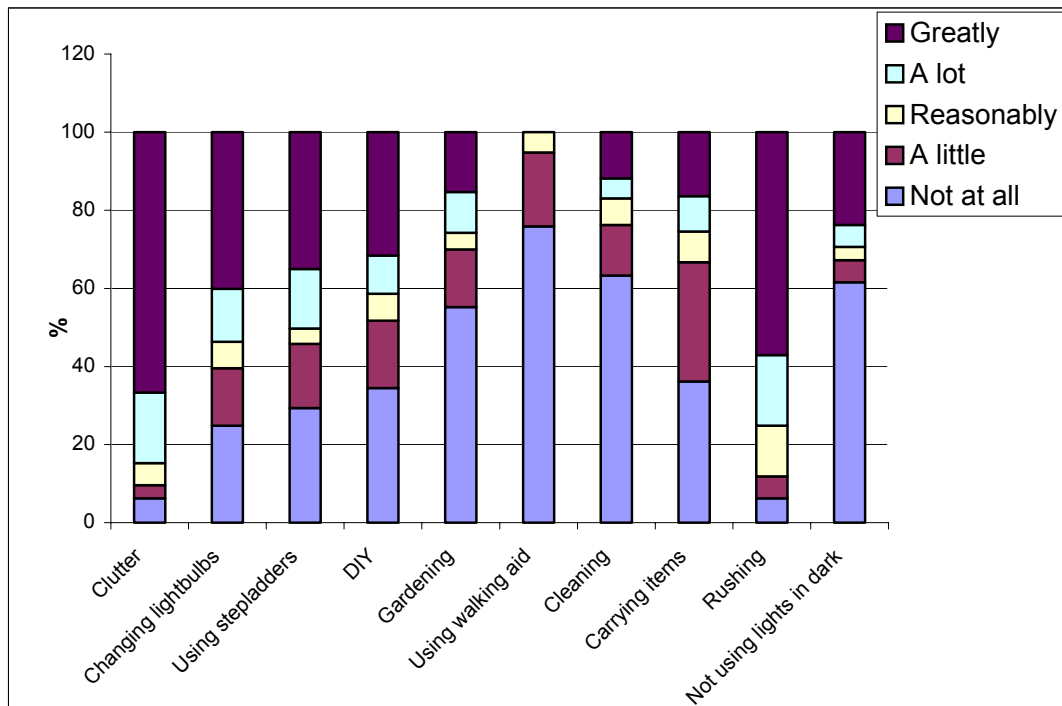
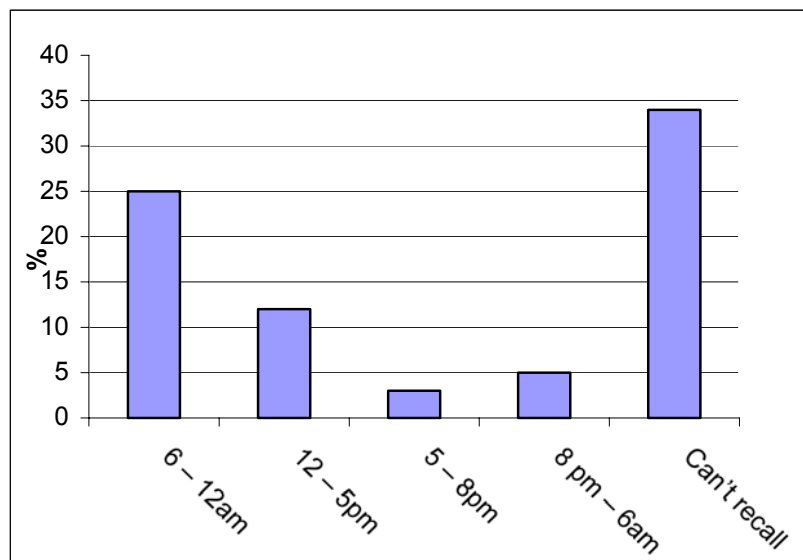


Figure 4.29: Times of day when falls occur



Within the sample, there was no association between dwelling type and fall history.

There were no significant differences between faller and non-faller groups between age or any of the indicators of functional ability (see Table 4.30).

Table 4.30: Details of fallers and non-fallers

	Fallers (n=85)	Non-Fallers (n=92)
Mean age	76.8 yrs	74.2 yrs
Mean number of medications being taken	2.6	2.1
Mean MMBI score*	19.8	20.2
Mean rise from stool ability score*	2.2	1.9
Mean grip strength	17.8 N	20.2 N
Ability to balance on 1 leg	9 seconds	12 seconds
Mean BMI score	26.5	26.0
Mean depth vision (uncorrected)	1.6	1.45
Visual acuity (corrected)	10.58	12.93
Mean units of alcohol/week	1.3	1.3

NB. *A lower value indicates a worse score.

When asked about the primary factor each ‘faller’ thought was involved with previous fall episodes, a majority reported extrinsic factors (44%) or behaviour (35%) played an important role, Figure 4.30. Tables 4.31 – 4.33 give a further breakdown of the perceived causal factors in falls.

Figure 4.30: Causes of falls

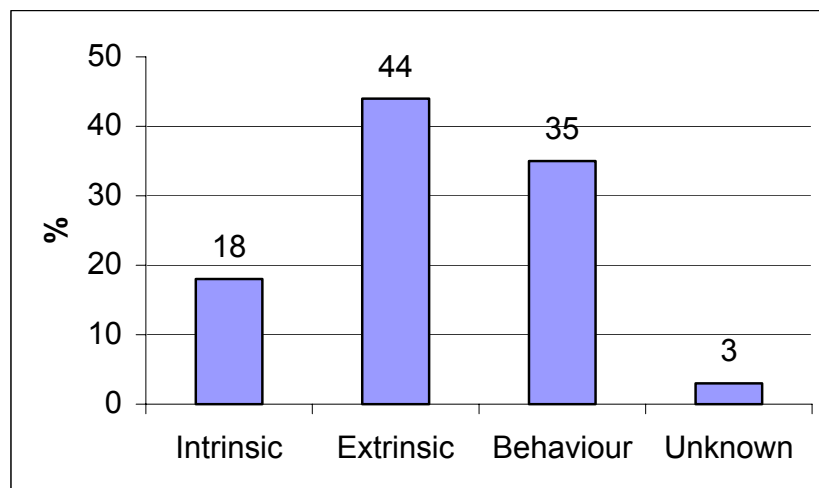


Table 4.31: Intrinsic factors in falling (within all causes of falls)

'Blackout'	4.5%
Dizziness	4.5%
Balance	4.5%
Body part gave way	4.5%

Table 4.32: Extrinsic factors in falling (within all causes of falls)

Trip over (unfixed) object, e.g. clutter	13%
Slippery surface (indoors)	10%
Slippery surface (outdoors)	7%
Uneven surface	5.5%
Trip over (fixed) object, e.g. furnishing	4.5%
Walking aid	2%
Other	1%

Table 4.33: Behavioural factors in falling (within all causes of falls)

Rushing	12%
Footwear	10%
Fall from height	5%
Light level	3%
Overstretching/bending	2%
Carrying	1%
Pets	1%
Use of spectacles	1%

Products involved in falls

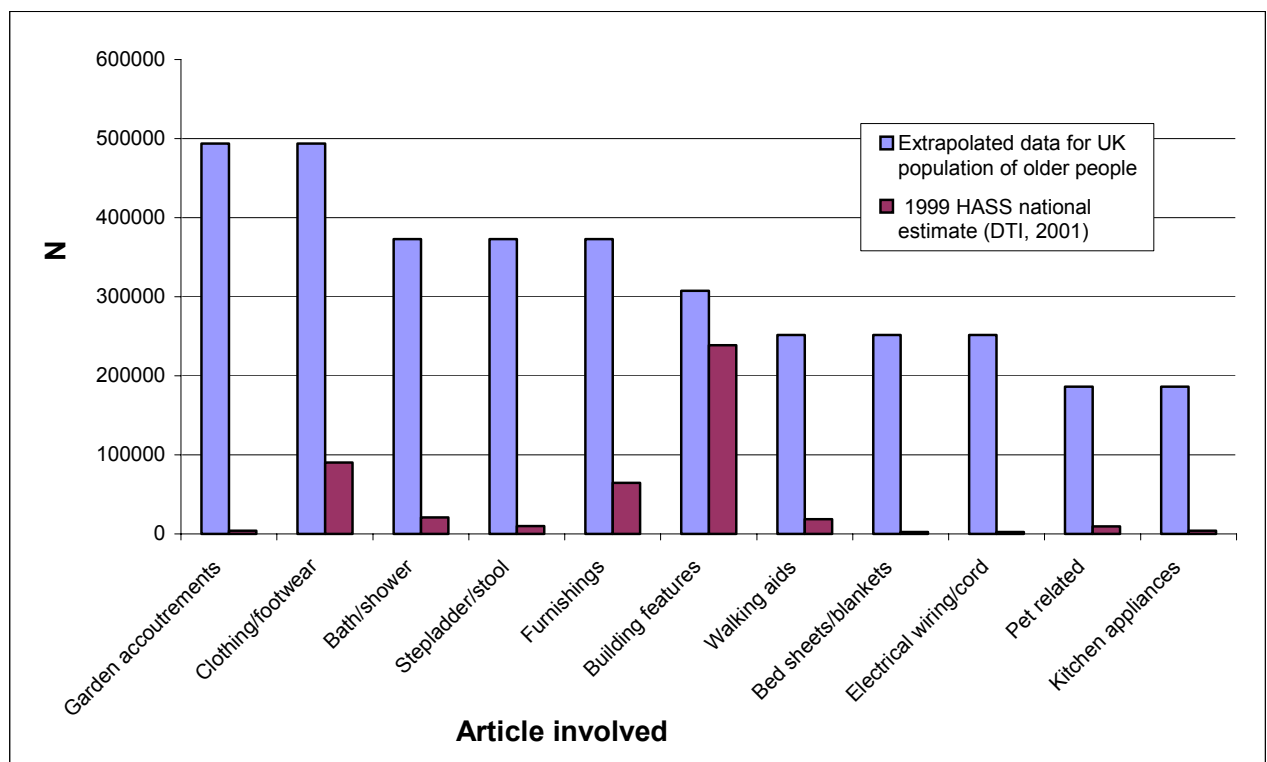
It is accepted that the HASS data account for the falls that result in more serious injury (admission to A&E), and therefore are not an accurate representation of the total number of falls that are occurring among older people in their homes across the UK.

If the fall incident data from this study are extrapolated up as percentages of falls occurring within the older UK population (65+), and compared to the HASS data for similar product categories, the results are interesting and shown in Figure 4.31.

Table 4.34: Product factors in falling (within all causes of falls)

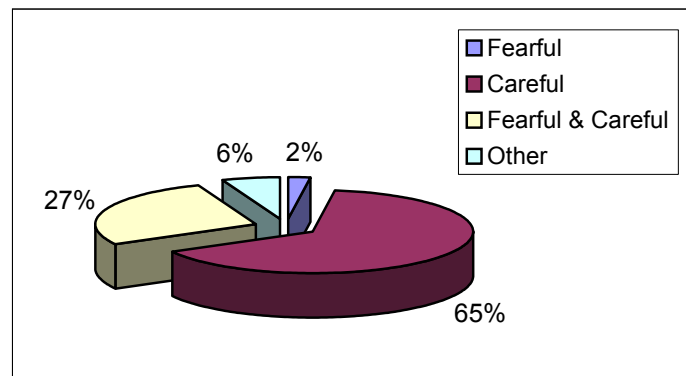
Product associated with fall	N of falls
Garden accoutrements, e.g. gardening tools, hosepipe, plant pot (tripping)	8
Clothing/footwear	8
Electric blanket cable, bed sheets (tripping)	6
Bath/shower (slipping)	6
Stepladder/stool (falling from height/tripping)	6
Rugs, low furnishings etc. (tripping)	6
Door threshold (tripping)	5
Walking aids (tripping over them/slipping)	4
Kitchen cupboard/oven/dishwasher door	3
Vacuum cleaner cord	2
Burglar alarm (rush to get to it)	1
Spectacles (bifocals) causing problems with vision	1
Newspaper left on the floor (slipping)	1

Figure 4.31: Falls among older people



After a fall episode, fallers reported feeling fearful and cautious in their behaviour (see Figure 4). Occasionally, participants also reported not feeling worried about falling as they take the attitude that ‘if it happens it happens’ (‘Other’).

Figure 4.32: Reported feelings post fall



The majority (79%) of fallers reported changing their behaviour since their last fall episode. Details are given in Table 4.35.

Table 4.35: Changes in behaviour after falling (multiple responses)

Take extra care/more attention when doing tasks	70%
Avoid rushing	19%
Environmental changes, e.g. lighting, clutter	17%
Curtailment of tasks, e.g. gardening, housework	9%
Change in footwear	6%
Watch where placing feet	5%
Wear fall alarm	2%

5 Discussion

5.1 Nature of sample

Although the sample provided a good range of ages and participant living circumstances, it may have been biased towards younger, healthier and more active individuals. This was at least in part due to the reduced likelihood of frailer persons participating in the study.

The different types of accommodation visited were varied, although a disproportionately high percentage of the householders were bungalow dwellers (36%, compared to 10% in the general population). There was a lower proportion of householders living in terraced housing than might have been expected (5%, compared to 27% in the general population). These proportions were due to bias towards higher socioeconomic status, in which the methods of recruitment and topic played a role.

5.2 Participant history of falls

When asked about falls that interviewees may have experienced in the 2 years prior to the visit, the type of questioning incorporated some of the recommended strategies to improve recall and accuracy of fall reports in cross-sectional studies, which included asking subjects about a specific period of time in the past (Cumming *et al.*, 1990).

Surprisingly, there were no significant differences between fallers and non-fallers in the sample for age or any of the indicators of functional ability, as might have been expected between the two groups. This suggests that in this group, at least, extrinsic causes of falls were more prevalent than intrinsic factors. This differs from the emphasis in recent literature reviews (e.g. AGS, 2001), where intrinsic causes of falls have been regarded as the primary issue.

There is consistency in our data, with respect to participants' attribution of the causes of their falls. Extrinsic factors were mentioned as fall initiating events in 44% of falls that

occurred among the sample population. Behavioural factors were attributed as the main cause of falls on 35% of occasions and intrinsic factors in 18% of cases. Explanations for this relatively high attribution of extrinsic and behavioural factors in the falls occurring among respondents, could be due to the questioning completed prior to the discussion of fall history resulting in education about these risk factors. However, it could also be due to the relative good health of the sample population and the fact that intrinsic factors play a lesser role in falls among such individuals.

“I was getting ready for bed. I went to get a book from the shelf in the spare room and the light was on. I got the book, switched the light off and moved, in the dark, back down the hall to the bathroom. I thought I was turning into the bathroom but was actually turning onto the stairs...because of the stairs, I slipped and fell down a few, to the turn in the stairwell.”

It appeared that the majority of falls among the sample population occurred between 6am and 12 noon, although due to the manner in which the data were collected, this is difficult to substantiate. However, the times of day reported for when falls occurred were distributed in a manner that coincides with the types of activities that are carried out during these periods of the day and health problems that might ensue.

Less than 1% of the sample reported knowing anyone who they thought was at risk of having a fall, although during discussion, almost all interviewees acknowledged the problem of falling among the older population. It is unclear why such a small proportion of the group reported being aware of anyone they knew as being at risk of falling. In part, this might reflect a poor understanding of the true extent of the risk.

The home environment survey may have been affected in some instances by interviewees tidying their homes, ready for their visitor (the interviewer). This may have given a misleading impression of tidiness and of temporary hazards.

“I try to keep it tidy, and always do a once round when visitors are coming...”

The home environment survey was also limited due to time and privacy constraints, although the same researcher carried out the survey on each occasion, providing consistency.

5.3 Behaviour in the home

Usage of the home was generally as might have been expected, with some areas being used more often than others, e.g. living areas compared to guest bedrooms. It was not apparent that any of the older people in the study had migrated to one room of their homes.

The behaviour of individuals was often observed to have influenced their environment. Untidiness and other reasons including the ownership of pets, resulted in items being left on the floor and clutter. The choice and provision of lighting had implications for safety, in terms of light levels, ease of maintenance and changing light bulbs. The choice of furnishings, e.g. rugs, unstable furniture, throws on chairs etc., had implications for tripping.

With regard to individual capability, it was apparent that the behaviour of individuals played a role. The use of medications and alcohol and their possible side effects had implications for dizziness and concentration. Choice of footwear had an influence on stability and balance. Choice and use of spectacles had consequences for vision and awareness. Some participants described how taking regular exercise had benefited their strength, balance and coordination.

The most serious behaviours which older people in the survey thought placed them at increased risk of falling in the home included leaving items on the floor (clutter) and rushing. These data tie in well with the factors that were most commonly associated with actual experience of falls, with clutter and rushing attributed as key factors in falling on the highest number of occasions (13% and 12% respectively) among the fallers in the sample. Although these behaviours are perceived as increasing risk, respondents reported that they do still hurry on occasions and leave items on the floor.

Other behaviours that the sample thought affected risk of falling included changing light bulbs, using stepladders and undertaking DIY activities. These again were factors in some actual falls, with falling from height, overstretching/bending and carrying attributed as key factors in falls on a number of occasions (5%, 2%, and 1% respectively).

As well as being apparent from this survey that older people engage in activities that increase their risk of falling, it is also apparent that there is inconsistency between what people say and what they do.

“I don’t rush around these days...(but) if there’s someone at the door, they don’t hang about so you have to get a move on.”

In some cases, it may be that a risk is not fully appreciated, e.g. carrying large objects in front of the body can increase the risk of falling due to obscured vision of the floor area and effects on balance. A lack of awareness by others may also lead to a dangerous situation. For example, objects left on the floor might cause difficulties for another member of the household, who is unaware the hazards are there.

Common reasons given for not leaving objects on the floor in the home by those who no longer do this included: general risk of falling (52%), poor mobility for reaching down to objects (11%) and poor vision making it possible that an individual would trip over items left on the floor (6%). It seems that safety behaviour with respect to avoiding introduction of trip hazards is not influenced by the importance of this to the individual, in terms of their functional abilities. However, when comparing observations of ‘clutter’ with MMBI score, use of a walking aid, deteriorating health, rise from stool ability and balance ability (stand on 1 leg test), there were no significant relationships evident (ns for all).

Alternatively, some people were very sensitive to the issue of fall safety and had made modifications themselves to their homes. In some instances, interviewees appeared to be ‘ageing gracefully’, by putting in place new mechanisms and methods for completing daily activities, and exercising a degree of caution in their behaviour.

“My stairs are very dark, even with the light on. I’ve put white stripes on the stair edges to make them safer...I used to run up and down them too, but I take more care now.”

This point relates well to the model proposed by Lord *et al.* (2001), which considers the interaction between an older person’s competence and the demands of the environment. The model suggests that as a person ages and their physical abilities decline, they have a higher risk of falling when environmental hazards are placed in the environment, because of the individual’s reduced ability to cope with these hazards.

5.3.1 Safety in different areas of the home

Interviewees reported taking extra care in the bathroom because they thought that they were at increased risk of falling in this location. However, according to HASS data (DTI, 2001), twice as many falls occur in the bedroom compared to the bathroom. This probably reflects the amount of time people spend in these different locations (exposure to hazards). Few interviewees mentioned the bedroom as an area of concern for falling, though with this perhaps is due to the nature of the environment and its perceived safety. Bedrooms tend to have soft coverings and carpets, whereas the bathroom might seem like a more dangerous location due to hard, sharp edges, and slippery floor surfaces. The activities that are undertaken in the different areas may also be a factor. The bedroom may be associated more with relaxation and sleep, whereas the bathroom may signal difficulty and worry about getting in and out of the shower/bath.

The garden environment clearly stands out as being the location where the majority of falls occur, both from this study sample and the HASS data. It is also the place where people in this study accurately thought that they were most likely to have a fall. The most common reasons for falling reported within the sample group in the garden included extrinsic risk factors (e.g. tripping on uneven ground/steps, and slipping on wet/icy surfaces).

The stairway is also an area worthy of discussion. Similarly to the bathroom, stairs are for the participants in this study, perceived as one of the most dangerous areas of the home, although the number of falls that actually occur in this location is a low proportion compared with other places in the home. The assessment of risk is almost certainly influenced by the difficulty people have with using stairs and the severity of injuries that occur when people do fall on them (Hill *et al.*, 2000).

When describing where they felt most at risk of falling, some individuals answered by relating to a location and its characteristics (e.g. the slippery floor in a kitchen), and others by relating to a task (e.g. washing the kitchen floor which makes it slippery). Is there a point where people differentiate between task safety and location safety? For example, a frailer individual may relate more to the location than to the task when considering fall safety, as they are less likely to be doing the task than a fitter individual, due to changes in physical ability. They are also more likely to be affected by the general environment (location), as they are less able to deal proficiently with it, than a more able individual.

5.3.2 Adapting to changing abilities

There were negative correlations between deteriorating health and changing light bulbs/undertaking DIY activities ($p < 0.05$ in both cases), as might be expected, however, there was no association between gardening, carrying items, or housework and deteriorating health.

It seems that there is an element of risk homeostasis arising in some instances, e.g. older people stop engaging in tasks when they do not feel safe doing them. However, from this study, it is only possible to speculate about explanations for this; it is feasible that task avoidance is due to an acknowledgement of reduced physical ability making the task more difficult and hence less safe; on the other hand, it is also conceivable that an accident or a near-miss has occurred, prompting the older person to reconsider their actions.

Almost 40% of the sample reported having modified their behaviour in some way to reduce their risk of falling. The most common changes to behaviour by interviewees included avoiding rushing, carrying bulky items, leaving things on the floor, gardening and using stepladders. Other measures included no longer engaging in particular household activities (using vacuum cleaner etc.), removal/repositioning of rugs, and modifying practices in the bathroom (e.g. altering method of getting in and out of bath).

“I now look down at the floor rather than ahead when I walk.”

These behavioural changes were all reported to have been prompted by declining mobility, strength, balance and coordination. Of the study group, 91% reported at least one health problem. With increasing number of health problems, the likelihood of a person making a change to their behaviour or environmental safety was increased. Similarly, the more medications being taken, the more likely an interviewee was to have made a behavioural change ($p < 0.01$).

“I wash down the slabs in the garden when they get slippery with moss...if I slip now, that’s it.”

“I have steps between my living room and kitchen where there are fitted handrails to hold onto...I have to concentrate so hard about where to put my feet to make sure I don’t trip on raised carpet or rugs...I often start to do something and forget to concentrate on my movements.”

However, 62% of the sample had not reported making any changes to behaviour, even though the majority (91%) of this group also reported one or more health problems. There was no statistical association between people who had changed their behaviour and their experience of past falls, either personally or someone else’s experiences. It appears, therefore, that experience of falling had not made much difference to the behaviour in this respect.

Among the 69% of individuals interviewed who had made safety changes to their home and of the 38% who had made changes to their behaviour, the majority of alterations were considered to be effective to some extent by respondents. However, it was not possible to measure the true effectiveness of the changes within this study.

“The grab rails in the bathroom were put in for my husband, but I’ve found them useful...”

5.4 Influence of social circumstances

It became apparent in the interviews that social circumstances have some influence on risk of falling. It was generally considered that if a person was wealthy enough, then they could afford to employ someone else to do ‘risky’ tasks. There are also limits on the extent to which changes can be made to the home environment, depending on the affluence of the householder.

“I’d love a downstairs toilet, but it’s just too expensive...I spend all day rushing up and down the stairs.”

Interviewees often related changes in their behaviour to changes in their social circumstances. This included situations where a partner was away from home or where a person now lived alone due to bereavement. For example, activities such as having a bath, undertaking DIY and gardening sometimes ceased when individuals no longer cohabited, due to perceived risk of falling, combined with a concern that if something did happen and they were on their own, no one would be aware of it.

“I don’t use the bath if I’m on my own in the house. I could easily slip and no one would know.”

It was also mentioned that when visitors come to the home, the amount of ‘clutter’ left on the floor could increase, e.g. children’s toys, handbags etc. However, the data analysis indicated that as the number of occupants in a home increased, the observed clutter

decreased ($p < 0.01$). This is counter-intuitive as it might be expected that more people result in more personal belongings and their movement. Other problems were also reported as arising during multiple-occupancy, e.g. being unaware of liquid/food spilt on the floor. Interestingly, it was reported by several interviewees that other members of the household leave items on the floor.

It was apparent among the sample that there were differences in social circumstances between different ethnicities. The majority of the Asian people interviewed lived with large, extended families. If a close social network is available, it is possible for some demanding activities to be done by other inhabitants, e.g. housework, gardening etc. This may well result in reduced exposure to activities and behaviours that increase the risk of falling.

5.5 Building features and fall risk

Situations were described where features of the building introduced risks. For example, steps within the house or garden (particularly in older properties) or difficult to access storage, such as kitchen or other cupboards that are too high to reach. Lack of storage space was another problem highlighted, resulting in objects being left on the floor, particularly if an occupant had moved into a smaller property than lived in previously.

“I try not to leave things out...it’s a small flat so I can’t help it sometimes”

Raised door thresholds, at both internal and external doorways, were remarked upon as dangerous places for falling, perceived as the 4th most dangerous place for having a fall (7%) among the sample population. This compares with HASS data (DTI, 2001) which indicates that the door threshold location accounts for just over 2% of falls in the home among the 65+ age group, 7th place out of all recorded fall locations.

“I fell whilst rushing to go out...I tripped over the door threshold – I was rushing and was tired.”

Simple features of the home environment e.g. grab rails, were thought to assist in tasks of everyday living, e.g. bathing, showering, moving up and down steps. Positioning of grab rails is important, however, with orientation to the user affecting ease of use and their effectiveness (Sveistrup *et al.*, 2002). In a few circumstances, other equipment had been used for safety, e.g. a gate at the top of the stairs to reduce the likelihood of stepping onto the stairs by accident when moving about at night.

Often, extra banisters or handrails had been fitted on the stairway. Occasionally, floor surfaces had been changed in the home to reduce slipperiness, e.g. linoleum changed to carpet. In some instances, rails and handles were used in the bedroom to assist with rising from the bed.

In some newer accommodation, it was interesting to note the location of the plug sockets, which instead of being just above floor level, were installed approximately 600mm up the wall. This arrangement was generally liked for ease of use, with reduced bending down to floor level to use a socket. However, a minority of interviewees found them aesthetically displeasing.

As presented in the results section, a number of households had undergone design changes in the garden (10%) in order to ‘make life easier’ for the occupant(s). Such changes included: removal of steps/lawn, and concreting patio areas for a flatter floor surface. However, these modifications sometimes resulted in the introduction of further problems, e.g. slippery surfaces. Simple modifications can easily cause problems if they are not thought through properly, and this is often the case.

5.6 Design and use of products

5.6.1 Household equipment

It was reported by participants how the design of some domestic products can contribute to falls. These include oven and dishwasher doors that open downwards forming a trip hazard, or cleaning equipment that is heavy and difficult to hold or carry.

The design of stepladders was an important issue for many interviewees and improved designs would be welcome. Features suggested were an additional high handrail and a tool holding compartment, to reduce the need for movement up and down the ladder to fetch items. Attention was also drawn to general stepladder construction, e.g. weight, size for storage. It appears that guidance is required for older people regarding choice of equipment and correct usage. It is also apparent that there are issues for designers and manufacturers to consider.

“I changed my net curtains to blinds to stop myself climbing up and taking them down to wash them all the time...”

The design of light shades and smoke alarms for ease of removal during bulb/battery changing was another feature that participants felt would be beneficial, and again would ease a task performed off the ground. Some individuals had made changes to their chairs and seating by building up the height of the legs, to make it easier for them to sit down and stand up. Anti slip mats were often used in the bath/shower to improve safety, and were thought to be advantageous. Other appliances commonly used and felt to be useful included bath boards and bath stools.

5.6.2 Personal aids

Toileting aids, including raised toilet seats and handles, had often been provided by local authority agencies, and were generally found to be useful. Occasionally, though such products were not accepted due to low aesthetics, comfort or ease of use.

“I did have a rail around the toilet but I didn't like it as it got in the way. I also had a perching stool but I didn't need it.”

5.6.3 Walking aids

Problems were reported using walking aids in the home environment, due to the changes in floor surface and texture, and limited room for manoeuvre. This discussion mostly

concerned 'zimmer frame' type appliances. The difficulty in storage of these aids was another issue raised in relation to tripping and falling. Situations also arise where older people, not being able to use their aids, use furniture instead as support, not intended for this purpose.

"I use a wooden stick. However it takes up one hand, and it's a third leg to co-ordinate, therefore need to pay attention when using it...I've tripped over it before"

"It's good to have the reassurance of a stick but often it is in the way"

"Zimmer...good but not enough space in the house...my hands are too weak to use sticks and I tend to just hold onto the furniture"

It was also mentioned that walking aids are particularly difficult to use in more cluttered and less spacious environments. This can be a particular problem if an older person has moved to a smaller home, and taken with them as much furniture and personal effects as possible, resulting in limited space for manoeuvre. In order to avoid abandonment of assistive devices, manufacturers and designers need to give attention to these issues.

Wide doorways were appreciated in the home when an occupant required the use of a walking frame, trolley or wheelchair, although were not commonly found.

5.6.4 Footwear and clothing

Footwear design, especially slippers, was thought by participants to be a factor in fall safety, particularly the thickness, grip and durability of the sole. Whilst some older people reported that they preferred to use footwear affording a good grip, to avoid problems on slippery surfaces, other participants reported that high grip soles could result in dragging of the foot and tripping.

"I often trip as the toe of my shoe catches on the floor due to tiredness or inattention."

“I discard slippery slippers, as you can be unaware of increased slipperiness.”

Differences in footwear and clothing between genders and amongst ethnic minority participants were obvious, e.g. use of high-heeled footwear, saris and other floor length clothing. When this issue was discussed with a warden of sheltered accommodation, he stated that generally “as older Asian ladies become more frail, they tend to wear their sari higher from the ground so as to reduce the chances of tripping”.

5.6.5 Fall alarms

Fall alarms were generally regarded by the sample as a good idea, particularly for people living on their own. However, this often did not translate into actual usage. Problems were reported with alarm products including comments that, ‘they get in the way’, ‘they’re uncomfortable to wear’, and ‘only old people wear them’. It is important to note that both the users and would-be users of these products reported feeling that the goods were marketed for older people. Conversely, it was reported by these older people that they often do not perceive themselves as being old and in need.

“I do have one but don't use it as it's annoying to wear around my neck...”

“I'll get one eventually, when I get old...”

When deciding on products to use in the home and changes to make to the environment, as might be expected, aesthetics is an important factor. However, as commented by the sample, this is often poorly addressed by manufacturers of products for older people, particularly in the design of assistive devices. There are equipment and devices that seem beneficial:

“I had one of those intercoms fitted for my front door...now instead of rushing about, I have a word on the intercom...it's safer in all respects.”

5.7 Sources of advice

Only 4% of the sample had seen or received any falls prevention advice in the past, and only 3 people could recall seeing information from the DTI “Avoiding Slips, Trips and Broken Hips” campaign. However, after being invited to read the DTI leaflet (“Avoiding slips, trips and broken hips”), the response was generally positive.

6 Conclusions

This study used focus groups and a combined interview and household survey to explore the role of behaviour and products in falls in the home among older people. As such, it provides insight into older peoples' interactions with their home environment that may affect risk of falling and their knowledge of factors affecting fall safety.

It is clear from the findings that there are many situations where the decisions and actions of older people affect their risk of having a fall. On the one hand, risk is affected by how older people equip, furnish, look after and use their homes. On the other, behaviour affecting individual capability plays a role through influences such as the use of medication and alcohol, ability to see correctly (eye tests and correct use of spectacles), and exercise (building and maintaining physical fitness).

This research supports previous suggestions (Hill *et al*, 2000; Haslam *et al*, 2001) that many risk factors for falling in the home are apparent to older people when prompted. However, this awareness does not necessarily influence how individuals behave in practice, and attention does need to be drawn to hazards. An as yet unanswered question is whether raised awareness then translates into safer practices and ultimately reduced number of falls.

Confronting the problem of older people falling in the home requires a holistic, ergonomics approach that addresses design, behavioural as well as medical and health issues. Falls are a multifactorial problem and need a multifactorial response (Close *et al*., 1999; AGS, 2001). The implications of Lord *et al*. 's model (2001), which describes falls in terms of the individual's ability to cope with environmental challenges, suggests it is all the more important to alleviate environmental challenges as people age. Improved building regulations and standards may be expected to lead to advances in the design of housing and the home environment over time. Developments with household appliances and personal products (walking aids, footwear etc.) could make a useful contribution to safety and general ease of use. Many of these design enhancements would benefit all users, not just older people.

The research has found that opportunities exist to reduce the risk of older people falling in and around the home, both with respect to behaviour and the design of products and buildings. Most importantly, the investigation has established that there is a need to raise awareness of the problem and provide practical fall prevention advice.

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8 Appendix

- 8.1 Information Sheet for Participants
- 8.2 Participant Informed Consent
- 8.3 Participant Information Questionnaire
- 8.4 Behaviour in the Home Questionnaire
- 8.5 Modifications Made to the Home Environment Questionnaire
- 8.6 Fall History Questionnaire
- 8.7 Ability to Carry Out Daily Activities Questionnaire
- 8.8 Physiological Measurements
- 8.9 Hazard Checklist

8.1 Information Sheet for Participants

The Contribution of Behaviour to Falls Among Older People In and Around the Home

Purpose

Slips, trips and falls are the most common type of accident in the home. The aim of this study is to investigate a wide range of factors that may increase the risk of an older person slipping, tripping or falling in the home.

The results will feed into the campaign “Avoiding Slips, Trips and Broken Hips” currently being run by the Department of Trade and Industry, and will help to improve future advice on how to avoid these accidents.

What is involved?

The study involves one interview, which will take place in your own home at a time to suit you. The visit will take approximately 1½ hours.

During the interview you will be asked some questions, including:

Whether you experience difficulty moving around the home

If you have ever fallen in the home

What factors you think may increase your risk of falling in the home

There will be some measurements taken, which will include:

Your height, weight and shoe size

Your vision will be tested with a distance chart

Getting up from a stool will test muscle strength in your legs

A test to measure your grip strength

I will also ask you how many prescribed medications you are taking daily.

Participation

You will not be asked to do anything you do not want to do or answer any questions you do not want to. You are free to withdraw from the study at any time. Please tell the researcher of any concerns you may have.

Who will have access to the details?

Your results will be confidential. However, anonymous excerpts may be used when the results are published.

8.2 Informed Consent

Informed Consent

My name is **Charlotte Brace** and I am a researcher on a project entitled:

The Contribution of Behaviour to Falls Among Older People in and Around the Home

This project is being undertaken on behalf of the Department of Trade and Industry and the results will be used for their campaign “Avoiding Slips, Trips and Broken Hips”.

Thank you for agreeing to be interviewed. The visit will involve some basic physiological assessments and a range of questions relating to your use of your home. The interview will last approximately 1½ hours.

Before we start I would like to emphasize that:

- **Your participation is entirely voluntary**
- **You are free to refuse to answer any questions**
- **You are free to refuse to do any of the physiological tests**
- **You are free to stop the interview at any time**

The interview will be strictly confidential and your results will be available only to members of the research team. However, anonymous excerpts from the interview may be used when the results are published.

Please sign this form to show that I have read the contents to you and you have had the opportunity to talk and ask questions about the project.

(signed)

(printed)

(date)

A report on the results of the project can be sent to your home address. Would you like a copy of this report?

Yes

No

8.3 Participant Information Questionnaire

About you:

Date of birth

M/F

Do you have any particular health problems that you think are related to falling?

Example	Yes	No	Details
Any dizziness on getting up quickly?	<input type="checkbox"/>	<input type="checkbox"/>	
Disorientation – don't know where you are	<input type="checkbox"/>	<input type="checkbox"/>	
Any other dizziness or balance problems? <i>(Meniere's disease, vertigo)</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Any problems with circulation? <i>(high blood pressure, stroke, blood clots)</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Any heart problems?	<input type="checkbox"/>	<input type="checkbox"/>	
Any respiratory problems? <i>(asthma, bronchitis)</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Any joint problems or joint replacements?	<input type="checkbox"/>	<input type="checkbox"/>	
Any other major disease <i>(diabetes - age at onset, use of insulin + numbness in hands/feet)</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Any serious injuries	<input type="checkbox"/>	<input type="checkbox"/>	
• Are you still affected?	<input type="checkbox"/>	<input type="checkbox"/>	
Other.....	<input type="checkbox"/>	<input type="checkbox"/>	

Daily medications.

How many prescribed medications do you take daily?

How many non-prescribed medications do you take daily?

Do any of your medications:

- Affect your vision?
- Make you feel drowsy?
- Make you feel dizzy?

Did your doctor or chemist warn you about any of these side affects?

How long have you lived in this house?

How many toilets do you have, where are they?

- If you have a second toilet did you have it fitted?
- Why?

Who else lives in the house with you?

What is the age of this property?

Postcode?

Type of house?

Do you have any restrictions on making changes to your house?
(eg *because it is rented*)

Vision:

Approximately how long ago did you last visit the opticians?
(eg 1, 2, 5, 10 years)

If you have not had your eyesight checked recently, do you think that you might need glasses/a new set of lenses?

--

If any, what type/s of glasses do you use?

Type	Y/N	Prescribed?	Date prescribed?	When are they worn?
None				
Reading				
TV				
Distance				
Bifocals				
Multifocals				

Reported problems with current glasses:

	Which pair of glasses do they wear for this activity?
Can't see TV	
Can't read book	
Can't see distances	
Problems all the time	

Do you think that the way (frequency) in which you wear your glasses affects your chances of having a fall? Why?

--

When do you have problems with your eyes when you are **not** wearing your glasses?

TV	
Around the house	
Long distances	
Reading	
All the time	

Describe the problems you have with your eyes?

Do you have any conditions that affect your vision?

	Yes	No	Details
Cataracts	<input type="checkbox"/>	<input type="checkbox"/>	
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	
Macular degeneration	<input type="checkbox"/>	<input type="checkbox"/>	
Colour vision defect	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	

Please specify other:

How often do you exercise?

Do you smoke?

Yes

No

Where in the house or garden do you feel most at risk of falling? Why?

--

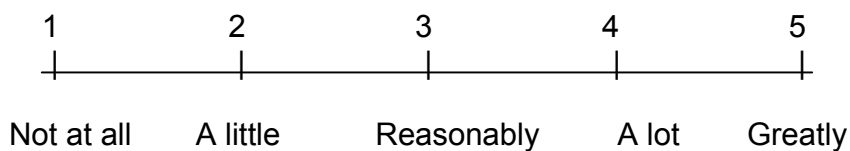
8.4 Behaviour in the Home Questionnaire

House Maintenance Activities

Do you usually change light bulbs yourself? **Yes** **No**

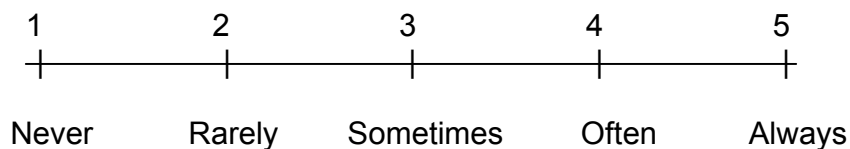
Why/why not? (Reasons for changes in behaviour)

How do you think that doing this affects your chances of having a fall?



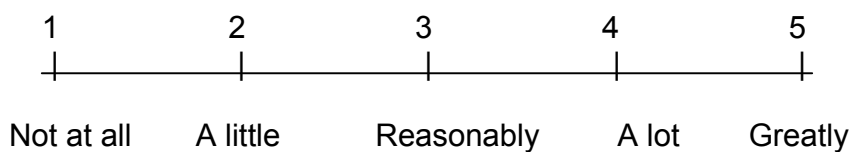
Do you use step ladders? **Yes** **No**

How often do you use them?



Why/why not? (*Reasons for changes in behaviour*)

How do you think that doing this affects your chances of having a fall?

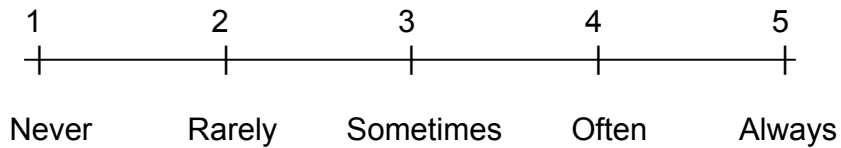


Do you do any DIY?

Yes

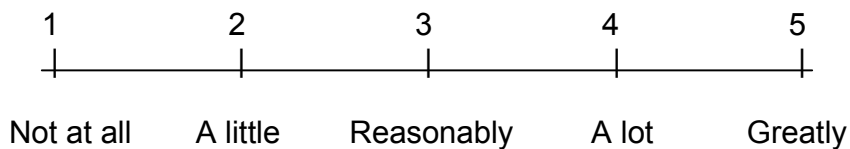
No

How often?



Why/why not? (*Reasons for changes in behaviour*)

How do you think this affects your chances of having a fall?

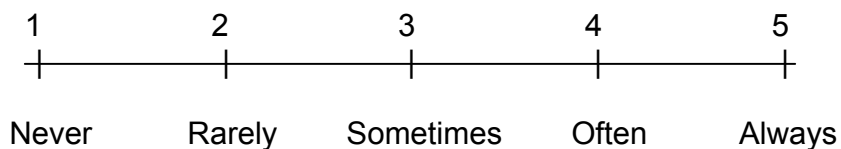


Do you do any gardening?

Yes

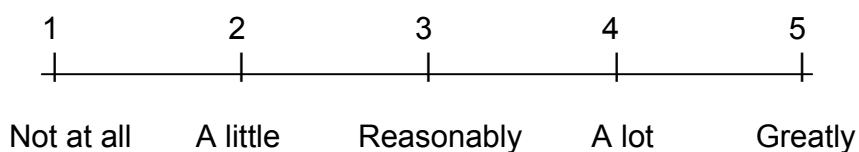
No

How often do you do this?



To what extent do you do this activity? Why/why do you do/not do it? (*Reasons for changes in behaviour*)

How do you think this affects your chances of having a fall?

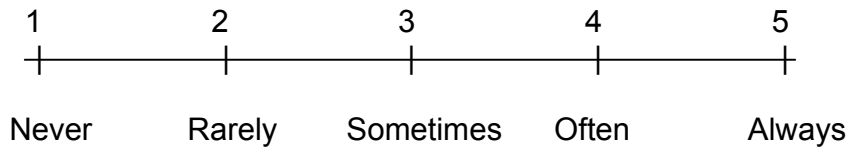


Do you clean the home yourself?

Yes

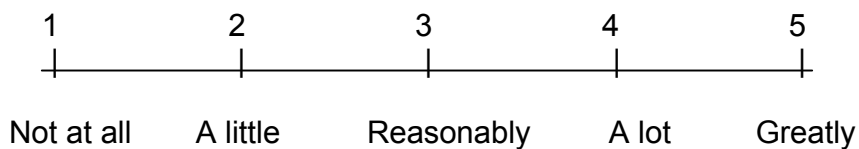
No

How often do you do this?



What do you do? Why/why not? (*Reasons for changes in behaviour*)

How do you think cleaning affects your chances of having a fall?

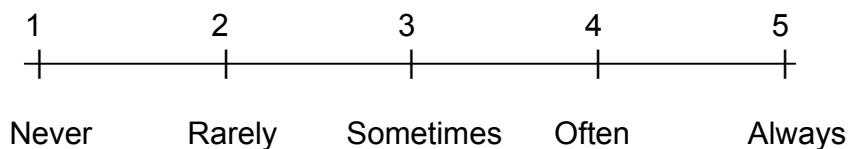


Do you ever leave things on the floor (clutter, shoes)?

Yes

No

How often do you do this?



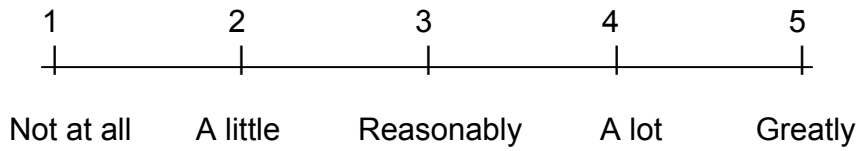
Why/why not? (*Reasons for changes in behaviour*)

I'm tidy

It's dangerous

Other:

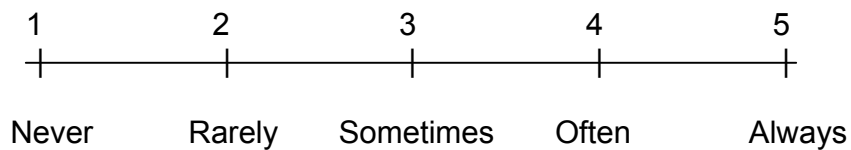
How do you think that leaving objects on the floor affects your chances of having a fall?



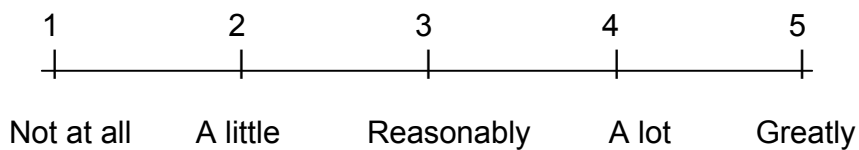
Do you carry/move things around the home? **Yes** **No**

What do you do? Why/why do you not do this? (*Reasons for changes in behaviour*)

How often do you do this?



How do you think this affects your chances of having a fall?



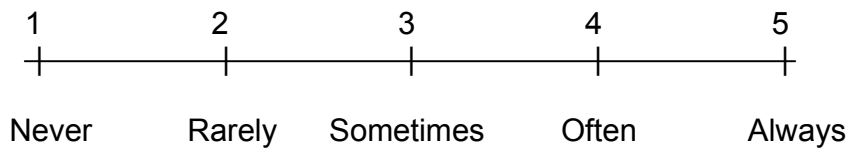
Personal Living

Do you use a walking aid?

Yes

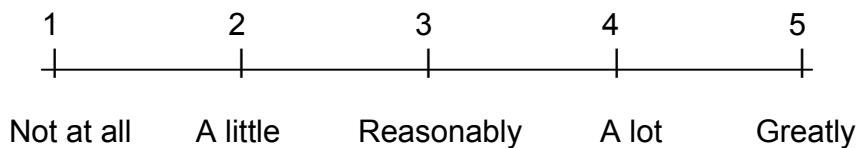
No

How often do you do this?



What type? Why do you use/not use it? (*Reasons for changes in behaviour*)

How do you think this affects your chances of having a fall?



Footwear - Do you wear any:

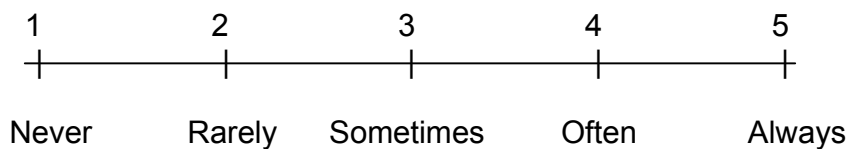
Loose fitting or open backed slippers?

Sandals?

Shoes with heels?

Or any other footwear that may cause you to slip or trip?

How often do you do this?

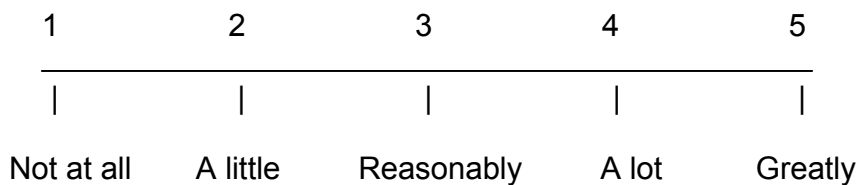


What do you wear inside the house?

What do you wear in the garden?

Why/why not? *(Reasons for changes in behaviour)*

How do you think wearing such footwear affects your chances of having a fall?



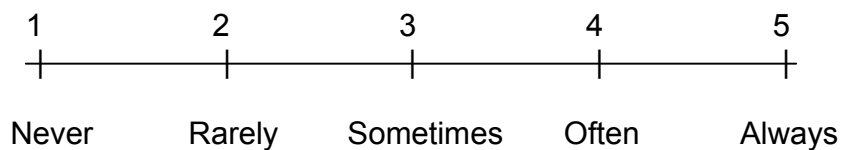
Do you ever hurry around in the house or garden?

Yes

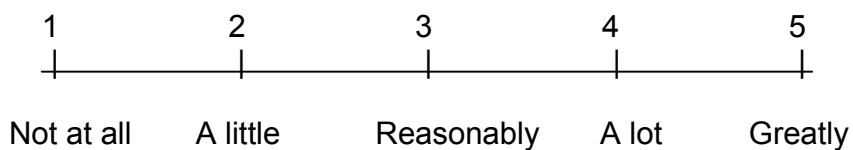
No

Why/why not? *(Reasons for changes in behaviour)*

How often do you do this?



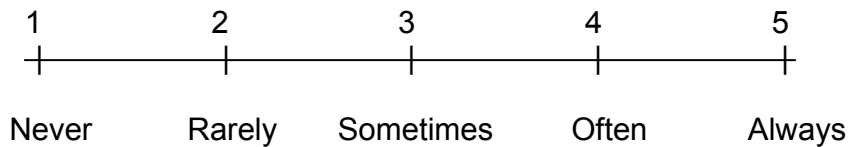
How do you think this affects your chances of having a fall?



Do you use any long life light bulbs? **Yes** **No**

When you go to the bathroom at night do you turn light on? **Yes** **No**

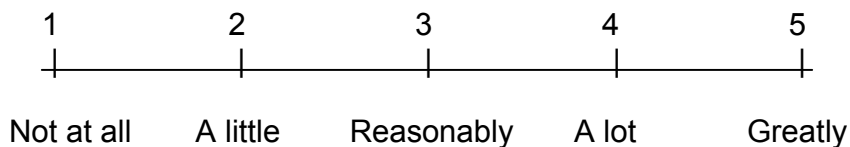
How often do you do this?



Why/why not? (*Reasons for changes in behaviour*)

--

How do you think this affects your chances of having a fall?



Alcohol

Do you drink alcohol? **Yes** **No**

In the last 7 days how many glasses of wine, sherry, beer or spirits have you drunk?

Wine

Sherry

Beer

Spirits

Other comments

--

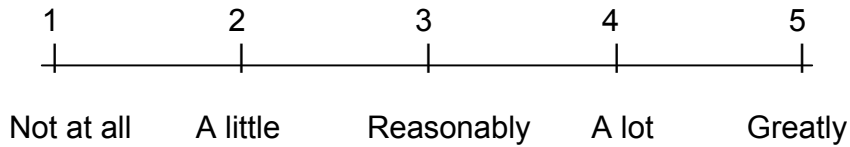
Was the last 7 days a typical week? **Yes** **No**

If you are taking medications do you avoid having a drink? **Yes** **No**

Why?

--

How do you think drinking affects your chances of having a fall?



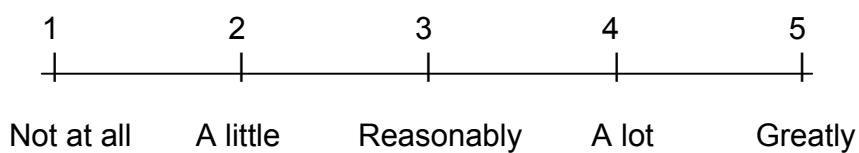
Cohabitation and Pets

Does anyone else live with you? **Yes** **No**

If you live in the house with someone else, do you think that you do risky activities that you may not do if you lived on your own? What?

Have you stopped doing things since you've been living on your own?

Do you think that living on your own affects your chance of having a fall?



Do you have any pets? **Yes** **No**

Do they ever “get under your feet”, you need to bend down to sort them out etc.?

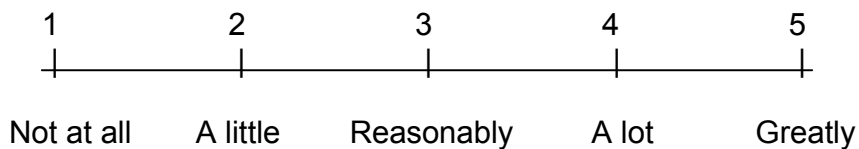
Yes **No**

How do you deal with this?

Are there any other aspects of having a pet that affects risk of falling?

Do you do ever have visitors to your home? **Yes** **No**

How do you think this affects your chances of having a fall?



When you visit the homes of friends or relatives and move around them do you find you have any problems? **Yes** **No**

Comments:

Are there any other activities that you might consider risky with regard to falling?
Yes **No**

Why/why not? (*Reasons for changes in behaviour*)

8.5 Modifications made to the home questionnaire

Changes

In the past 5 years have you had anything done to your home to make it safer?
(e.g. hand rail, longlife bulbs, grab rail, antislip mats, changed lamp shades, put in brighter light bulbs etc...)

- Why?

In the past 5 years have you made any changes to the way you move about your home so that you feel safer when you use them?
(eg make a point of using the handrail, clean differently, careful not to hurry, don't leave objects on the floor etc...)

- Why?

As you get older can you anticipate any changes you might make to your home?

- What changes would be acceptable to you?
- Consider if older relatives visit, how would you change things for them?

As you get older can you anticipate any changes you might make to the way you move about your home?

- What changes would be acceptable to you?
- Consider if older relatives visit, how would you do things with them?

Do you know of anybody who has fallen in the home?

- Do you know what happened?

Has this person's experience had an effect on how you move about your home?

- How?

Do you know any other people who you feel may be at risk of falling in the home?

- What do you think they might do to reduce their risks?

	Do you use any of the following?		Would you use one?	
	Yes	No	Yes	No
Fall alarm (explanation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Why?				
Hip protector (photo)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Why?				
Bath hoist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Why?				

Other issues

Does moving around the home cause you discomfort in any way?

- If so in what way?

Have you seen or received any advice about fall safety from:

	Yes	No
--	-----	----

Occupational therapist or physiotherapist		
---	--	--

Community Care worker		
-----------------------	--	--

Poster/leaflet campaigns		
--------------------------	--	--

TV adverts (not advertising stair lifts)		
--	--	--

Other		
-------	--	--

Please specify other:

.....

What did you think of this advice?

- Was it useful?
- Did it encourage you to do anything

Do you think that it's important that information is available on this?

8.6 Fall History Questionnaire

How many times have you slipped, tripped or fallen in your home or the homes of friends or relatives in the last 12 months?

We are interested in any slips, trips, stumbles or falls you may have had in your home or the homes of friends or relatives, where either you hurt yourself or you might have hurt yourself.

(e.g. tripping over a pet, foot not properly on the step etc...)

What happened?

In whose home did the fall happen?

- | | |
|-----------------------------------|--------------------------|
| Own home | <input type="checkbox"/> |
| Home of a friend or family member | <input type="checkbox"/> |
| Other | <input type="checkbox"/> |

Specify other:

Approximately how long ago did it happen?

What time of day did it happen?

- | | |
|---|--------------------------|
| Morning (6am until 12 noon) | <input type="checkbox"/> |
| Afternoon (12 noon – 5pm) | <input type="checkbox"/> |
| Early evening (5pm - 8pm) | <input type="checkbox"/> |
| Late evening / during the night (8pm – 6am) | <input type="checkbox"/> |
| Cannot remember | <input type="checkbox"/> |

Can you describe what happened?

- What were you doing at the time you fell?

Was the light on or off at the time you fell? On Off

Do you feel that this factor contributed to your fall? Yes No

- Please explain your answer below:

Were you wearing glasses at the time you fell? Yes No

Which type?

Do you feel that this factor contributed to your fall? Yes No

- Please explain your answer below:

Did you suffer any injuries? Yes No

- If 'Yes', please describe them below:

If applicable, approximately how long after your fall did you seek medical help?
(eg minutes, hours, days)

How did you treat your injuries? (eg called for ambulance, went to GP, treated injuries at home, no treatment needed)

Are you still affected by your injuries?

Yes

No

- In what way are you still affected?

After this slip, trip or fall, have you changed your behaviour in any way, e.g. walk more slowly, switch light on? Why?

Yes

No

After this fall, how did you feel:

more fearful?

more careful?

Do you have any fears about falling in the home?

- Why?

Have you made any modifications to your home after a fall?

Do you have any other comments?

8.7 Ability to Carry Out Activities of Daily Living Questionnaire

Please rate your ability to do the following activities:

(Please cross one box per activity)

	I can do alone without difficulty	I can do alone but with difficulty	I can do but need help or assistance	Unable to do
Bathing / showering.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dressing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cooking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Walking within the home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Light housework	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heavier housework				
eg washing windows & floors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climb one flight of stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shopping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8.8 Physiological Measurements

Weight. (KG)

--

Current Height (mm)

--

Size of shoe

--

Grip strength test. (Kgf)

Right Hand Grips
1
2
3
4

Left Hand Grips
6
7
8
9

5 Average:

10 Average:

Stand on one leg test.

No shoes should be worn for this test. Stand on one leg with the other leg positioned half way up the calf of the supporting leg. Time for up to 30 seconds only. Stop timing at 30 seconds or when the subject puts a foot down on the floor, which ever comes first.

Time for right leg.

Time for left leg.

Other comments

Rise from stool without using hands.

No shoes should be worn for this test. Subject should sit on the stool so that their feet are flat on the floor and their hips and knees are at 90°.

	How well do you think you will do?	How they actually did:
Able to do without difficulty	<input type="checkbox"/>	<input type="checkbox"/>
Able to do, but experienced some difficulty	<input type="checkbox"/>	<input type="checkbox"/>
Able to do, but experienced a lot of difficulty	<input type="checkbox"/>	<input type="checkbox"/>
Unable to do	<input type="checkbox"/>	<input type="checkbox"/>
Decided not to attempt	<input type="checkbox"/>	<input type="checkbox"/>

Depth Vision Test.

Firstly test subject with no glasses. Place the Frisby Plate on a plain white background and ask the subject what they can see. The subject should view the plate squarely with head and plate held still.

Glasses off

Able to see ☐

Unable to see ☐

Repeat test with glasses on

Able to see ☐

Unable to see ☐

Distance Vision Test

Place Snellen Chart 2.5 metres away from the subject in a well-lit area. Subject to read letters with no glasses or contact lenses. Count the number of letters correctly identified. Use light box to light room.

Line 1:
Line 2:
Line 3:
Line 4:
Line 5:
Line 6:
Line 7:

Repeat test with glasses on:

Line 1:
Line 2:
Line 3:
Line 4:
Line 5:
Line 6:
Line 7:

Comments

--

8.9 Hazard Checklist

Location Outside:

Participant Number:.....

Area	Hazard Prompts	Yes	No
Floor	Clutter, debris		
	Cables/wires trailing		
	Worn floor covering		
	Slippery surface		
	Loose coverings		
	Dark floor surface		
	Patterned surface		
	Uneven surface		
	Changes in surface		
	Steps		
	Stairs		
	Pets underfoot		
	Other		
	Other		
Furnishings	Distractions		
	Low lying furniture		
	Unsteady furniture		
	Limited turning space		
	Inaccessible areas		
	Other		
	Other		
Environmental	Lighting levels low, poorly lit		
	Other		
	Other		

Positive points? *Grab rails, antislip mats etc.*

Location Inside:

Participant Number:.....

Area	Hazard Prompts	Yes	No
Floor	Clutter		
	Cables/wires trailing		
	Worn floor covering		
	Slippery surface		
	Loose coverings, rugs etc.		
	Hanging fabrics, e.g. bedspread		
	Dark floor surface		
	Patterned surface		
	Uneven surface		
	Changes in surface		
	Insecure carpet edges		
	Raised floor thresholds		
	Steps		
	Stairs		
	Pets underfoot		
	Other		
	Other		
Furnishings	Inaccessible cupboards		
	Distractions, e.g. mirrors		
	Low lying furniture		
	Unsteady furniture		
	Access impaired		
	Limited turning space		
	Inaccessible windows/curtains		
	Other		
	Other		
Environmental	Temperature low		
	Temperature high		
	Lighting levels low, poorly lit		
	Other		
	Other		

Positive points? *Grab rails, antislip mats etc.*