The contribution of behaviour to falls among older people in and around the home

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The Contribution Of Behaviour To Falls Among Older People In And Around The Home

Charlotte L. Brace

Doctoral thesis

Submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University.

April 2004

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Abstract

This thesis examines the contribution of behaviour to falls among older people in and around the home. Falls are an extensive problem, with the scale of this set to worsen in line with the increasing older population. Risk factors for falls have received much attention during recent years, although little emphasis has been given to the role of behaviour in falls risk. It is argued in the thesis that older people play an active role in their exposure to risk, influenced by their attitudes, beliefs and motivations. This aspect has received only limited consideration.

The research consisted of five studies. The first three investigations used a triangulated approach to examine the contribution and role of older people's behaviour, physical ability and home environment design in fall risk. The fourth study considered the role of health practitioners in fall prevention and investigated barriers to successful interventions. The final study examined the contribution of a health psychology framework to understanding fall related behaviour among older people.

In the initial phase of the research, five focus groups were undertaken with 30 older people. This process allowed preliminary information on fall-related behaviour to be obtained and explored older people's perception of risk and fall causation. The information gathered by this study was used to design a detailed interview investigation, involving one hundred and fifty home interviews, with a sample of 177 older people. The interviews collected comprehensive information using both quantitative and qualitative techniques. Attention was directed at older peoples' interactions with their home environment and their knowledge of factors which affect risk of falling. In a further study, the interview cohort was followed up over the subsequent year, investigating behavioural and design factors in actual falls.

From these first three studies, common perceived behavioural risk factors for falls amongst participants included undertaking house maintenance, rushing, the use of inappropriate footwear and tripping over objects. A strong
A relationship was found between falls in the garden and extrinsic risk factors, highlighting a need for improved design.

Individuals' perceptions of risk prior to the prospective study, compared well with the factors they commonly associated with their actual experience of falls during the follow-up period. Although particular behaviours (e.g. rushing, carrying objects, leaving items underfoot) were perceived as increasing risk, respondents reported that they still continued to engage in them.

A questionnaire survey, administered to participants at two fall prevention conferences, was used to investigate the perceptions of health professionals working in the field of falls prevention among older people. From the 117 responses, results suggested that there is wide and contradictory opinion amongst different groups of health professionals, which differs from the state of knowledge expressed in the contemporary scientific literature. Behavioural risk factors and behavioural intervention measures were both rated as highly significant by respondents in understanding and preventing falls among older people. Additional qualitative information from the survey described poor compliance by older people, and poor education and health promotion as some of the key barriers in the prevention process.

A final study examined the contribution of a health psychology framework to understanding fall-related behaviour among older people. The Transtheoretical Model, which proposes a set of stages that classifies an individual's motivation readiness for engaging in behaviour change, was used to examine data from the triangulated approach. The findings of this study suggested that, with further examination, processes of change that are targeted to older people's beliefs and perceptions might facilitate safer behaviour, resulting in fewer falls, fewer injuries and improved quality of life.

It is clear from the research that there are many situations where the decisions and actions of older people affect their risk of falling. It is argued that confronting the problem of older people falling in the home requires a holistic, ergonomics approach, which addresses design and behavioural
factors as well as medical and health issues. Falls are a multifactorial problem and need a multifactorial response. The research has identified opportunities to reduce the risk of falls among older people, 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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Chapter 1
INTRODUCTION

1.1 Problem statement

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 2002, over 370,000 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 2003). These figures do not include patients seeing their GP or those not seeking treatment. Furthermore, these figures may well be the ‘tip of the iceberg’. The extent of falls among the older population may be significantly larger than these figures suggest, due to the number of unreported episodes and falls that do not require medical treatment.

Fall related incidences are influencing factors in nearly half of the events leading to long-term institutional care in older people (Kennedy and Coppard 1987). Clearly, if the incidence of falls can be reduced, people can live longer, more healthily and more independently in their own homes, with a better quality of life.

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 a high prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a relatively mild fall dangerous.
Over 400 potential risk factors for falling have been identified, which are commonly split into categories of intrinsic and extrinsic risk. However, individual fall incidents are generally multifactorial. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls, e.g. decreased balance ability, disturbed gait, cognitive impairment, reduced strength, impaired vision, illness, and side effects from use of medication. Research has estimated that intrinsic risk factors play a role in approximately 50% of falls amongst a combined group of institutionalised and community dwelling older people (Rubenstein and Josephson 1996). Extrinsic factors are environmental hazards that present an opportunity for a fall to occur, including floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting, problems with walking aids and equipment, ill-fitting footwear, sensory surround and feedback (audio and visual), placement of furniture Environment-related risk factors are reported to be causal in around 33% of falls. Previous research (Hill et al 2000) has identified important behavioural factors which affect the risk of older people falling in the home, e.g. rushing, carrying objects; these findings indicate that behaviour contributes to approximately 35% of falls. It has also been found that behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, affecting confidence and fear of falling.

1.2 Background to the project

In recent years, strategies to tackle falls and injuries from falls have a become a policy imperative for the National Health Service, local authorities, and other organisations. Data on fall incidence in the home has been captured by the Department of Trade and Industry’s (DTI) HASS database. In 1999, the DTI launched a 3 year campaign, Avoiding slips, trips and broken hips (ASTBH) to raise awareness of falls in the home among older people. This campaign was targeted at older people, their families and friends.

The research reported in this thesis was the second study commissioned by DTI as part of the ASTBH campaign to investigate falls among older people in
the home. The current research developed from a previous study investigating older people's safety behaviour on the stairs, funded by DTI, 1999 – 2000 (Hill, Haslam, Sloane, Brooke-Wavell, Howarth). The project managers (Haslam, Brooke-Wavell, Howarth) were successful in securing additional funding from DTI for the period September 2000 – February 2002, to investigate the contribution of behaviour to falls among older people in and around the home.

The proposal was to undertake an 18-month research programme, the main focus of which was to undertake 150 detailed home interviews with older people. This information and the preliminary focus groups that were undertaken to assist with design of the survey, made up the body of the Loughborough University/DTI report (Brace et al 2003). This thesis concerns the examination of the interview and focus group data, with follow up of interviewees over a subsequent year, combined with a questionnaire survey of health practitioners working with older people at risk of falling, and investigation of the use of health psychology frameworks for understanding fall related behaviour among older people.

1.3 The research aims

The main aim of the research was to provide an understanding of how behaviour contributes to falls among older people in and around the home. The research initially focused on the behaviour of older people, but it soon became apparent that the behaviour of other stakeholders (e.g. friends, family and carers of older people, including health practitioners) was important.

The objectives of the research were:

- To collect information on patterns of behaviour around the home likely to affect risk of falling

- To investigate the interaction between multiple risk factors for falls
- To assess the extent and accuracy of older people's knowledge of factors affecting risk of falling

- To 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

- To collect the views of health practitioners regarding fall risk and intervention strategies

1.4 Research methodology

This was the first all-encompassing study collating information on all aspects of fall risk among older people. It was also the first to use an ergonomics approach to understand risk and interactions between types of fall risk factors for older people. Falls have previously been considered as a medical phenomena, with a little risk from the environment. Unusually, the role of behaviour in fall risk has not been considered, despite its obvious implications. This is the first time that a variety of quantitative, qualitative, accident-centred and accident-independent methods (after Bentley and Haslam 2001) have been used to investigate falls among older people. Recognizing the imperfections in each data collection method, data validity is increased with the ability to verify one set of data against data from another collection method. Gathering from a mixed approach should ensure balanced results. This triangulation approach (Dekker 2002) can help to maximise confidence in the validity of findings. In triangulation, all data items are corroborated from at least one other source and normally also via another method of data collection. Any one method can, arguably, produce results of weaker validity than a combination. Using different methods and sources helps to address this problem, and can strengthen researchers' beliefs in the validity of their observations.

A flow chart of the methods are shown in Figure 1.1.
Focus groups
A preliminary investigation into the contribution of behaviour to fall risk:

Home interviews
to investigate fall-related knowledge and behaviour among older people

Fall notification period
An investigation of prospective fall episodes

Consultation of health professionals:
perception of falls among older people
An investigation of prospective fall episodes

Application of the transtheoretical approach
to falls among older people

Discussion and Conclusions
Falls among older people

Review of the literature
Falls among older people

Figure 1.1 An overview of the project methodology
1.5 Outline of the thesis

The research is presented over seven further chapters. The first is the background to the research area. The next five chapters describe the methodology, data collection and results, and the final chapter discusses the outcomes and concludes the research. The content of each chapter is described below:

Chapter 2 reviews the published literature, profiling the history and extent of the problem of falls among older people, the commonly assumed risk factors, and the methods of prevention. It summarises and critiques the policy guidance for the UK, and highlights how the research aims of this project were designed to examine the gaps in current understanding.

Chapter 3 describes the use and the outcomes of focus groups that were undertaken to gain preliminary information on fall related behaviour and to explore older people's perception of risk and fall causation.

Chapter 4 reports the outcome of detailed home interviews with older people which were used to collect qualitative and quantitative information on the key behaviours for fall risk and other additional factors.

Chapter 5 reports the follow up of the same cohort over the course of the subsequent year, whilst monitoring fall episodes. The study investigated behavioural and design factors in actual falls and compared the data to physical and behavioural characteristics.

Previous chapters suggested that older people's behavioural non-compliance is a contributor to fall risk. Chapter 6 details a consultation with experts to investigate the perceptions of health professionals working in the field of falls prevention among older people.

Chapter 7 examines the contribution of a health psychology framework to understanding fall related behaviour among older people. The
Transtheoretical Model, which proposes a set of stages that classifies an individual's motivation readiness for engaging in behaviour change, was used to examine data from the triangulated approach.

Chapter 8 reviews the findings of the whole thesis. The implications of the research for furthering the understanding of the research problem were addressed and the contributions to the knowledge offered by this research were suggested. A critique of the research methodology is followed with ideas for the direction of future work and final conclusions.
Chapter 2

FALLS AMONG OLDER PEOPLE: A REVIEW OF THE LITERATURE

2.1 Chapter summary

This chapter presents a review of the literature on falls among older people. The nature and scale of the falls epidemic are described from an international perspective, with respect to community dwelling older people and those in residential and hospital care. The psychological and physical costs to older people are illustrated and the implications for the supporting health care systems are highlighted.

The chapter introduces the risk factors for falls among older people with the use of the common intrinsic and extrinsic risk categories. In order to show the diverse nature of the many contributing issues, other implicated risk factors which have been comparatively under-investigated, are also discussed, including behavioural risk factors. Each category of risk factor is explained, with evidence from the literature justifying the extent of each factor in fall risk. The section is then summarised and the strengths of association of risk factors currently understood to be involved in falls are illustrated.

Fall prevention strategies are described including the three different types of response (Easterbrook et al 2001): decreasing the number of first falls; minimising injury when people do fall; and reducing the chances of individuals falling again. The approaches to fall prevention that have been studied in detail are reported, including multifactorial, 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/cognitive interventions are also examined. Recently published expert reviews on methods of fall prevention have been summarized and the findings commented upon. Following this, there is a discussion of the
modification of behaviour in fall prevention and a summary of the intervention techniques.

Policy approaches for assessing and reducing falls are then introduced and critiqued, including the National Service Framework for Older People, Standard 6: Falls (DoH 2001).

The chapter concludes by summarising the key issues raised and highlighting implications with respect to the proposed project research.

2.2 Terms and definitions

2.2.1 A fall

The definition of a fall is 'an event that results in a person coming to rest inadvertently on the ground or a lower level than they were at previously as a result of something other than experiencing a violent blow, loss of consciousness, sudden onset of paralysis, or an epileptic seizure' (Gibson et al 1987). To compare, a stumble is 'an event in which a person loses balance but regains it before coming to rest on the ground' (Teno et al 1990).

Although falls are very often referred to as accidents, it has been statistically shown that the incidence of falls differs significantly from a Poisson distribution (Grimley-Evans 1990), which implies that falls are not simply random events; causal processes are involved (Lord et al 2001).

2.2.2 An older person

Throughout the majority of the literature, and in the duration of this research, an older person is defined as someone aged 65 or older.
2.3 Falls among Older People: Nature and Scale of the Problem

Before reviewing the published literature that investigates causal factors in falls among older people, this section describes the nature and scale of the problem, using incidence statistics from different populations and groups of older people. The section details where falls are occurring and their consequences, including physical and psychological damage, and the cost to older people, and to society as a whole. Gaps in this area of knowledge are then outlined. Unless stated specifically, the studies discussed are from a range of international research as the UK is not alone in experiencing an aging and ‘fall susceptible’ society. Most industrialised nations, including the USA, Australia and much of Europe, are experiencing problems of a similar scale, ensuring that falls are a matter for international concern (Easterbrook et al 2001).

2.3.1 Incidence statistics

Falls are the leading cause of injury-related hospitalisation in persons aged 65 years and over, and account for 4% of all hospital admissions in this age group (Baker and Harvey 1985). The majority of research has concentrated on identifying risk of falling in community-dwelling populations, as a foundation for primary prevention strategies. For the most part, these risk factors relate to people in hospital, rehabilitation and nursing home settings.

As would be expected, there are slightly different estimated fall incidences of falls among differing populations of older people, although the general trend is always the same: the incidence of falls (and the severity of the consequences) increases sharply after the age of 60.

Community-dwelling older people

Approximately 35-40% of community-dwelling, generally healthy older people aged 65 and over, fall each year (Feder et al 2000; AGS 2001; Lamb 2001; Gillespie et al 2003). With increasing age, the likelihood of falling increases steadily: after the age of 80 approximately 1 in 2 older adults are falling annually (Prudham and Evans 1981).
In the UK, Home Accident Surveillance System (HASS) data indicated that in 2002 over 370,000 people aged 65 or older attended A&E Departments due to a fall in the home (DTI 2003). It can be expected that these numbers are significantly lower than the real figures due to many people not attending A&E after a fall. Fall episodes have been steadily increasing in number over the past few years, in line with the ever-increasing older population, Figure 2.1. Five years ago almost 2000 older people died as a consequence of a fall (Metra Martech 1999). It can be estimated that this figure has increased appreciably in the intervening years.

![Graph showing the frequency of falls in the home among older people from 1998 to 2002.](image)

Figure 2.1 UK estimate of the frequency of falls in the home among older people (based on data in DTI 1999; 2000; 2003)

These high numbers of falls are particularly significant as fall related incidences are influencing factors in nearly half of the events leading to long-term institutional care in older people (Kennedy and Coppard 1987).

**Older people in a hospital environment**

Incidence rates of falls in nursing homes and hospitals are almost 3 times the rates for community dwelling people aged 65 or over (1.5 falls per bed annually) (AGS 2001).
Acute and volume depleting illnesses, incontinence and delirium are strong risk factors for falling during a hospital stay. Several studies have demonstrated that falling is one of the commonest complications during recovery from stroke (Langhorne et al 2000).

Residents of long-term care institutions

Other studies on the prevalence of falls have also been undertaken in institutions, where again, as might be expected, the reported frequency is much higher than among community-dwelling older people.

Nursing home populations are at high risk of falling and injurious falls, most likely because of the high prevalence of physical frailty, cognitive impairment and severe neurological illness. Within this environment, bedrooms are high-risk areas (Fleming and Prendergast 1993).

Luukinen et al (1994) investigated the incidence of falls among the older population (aged over 70) in Finland and estimated that the rate of falling among the institutionalised population is three times higher than that among those living independently in the community. Prospective studies conducted in nursing homes over a 12-month period have found incidence rates ranging from 30-56% (Fernie et al 1982; Lipsitz et al 1991; Yip and Cumming 1994). Rubenstein et al (1988) summarised the findings from studies on the incidence of falls in long term care institutions and calculated that the incidence rate ranged between 60% to 290% per bed, with a mean incidence rate of 1.7 falls per person per year.

Within institutional establishments, injury rates are in the territory of 10-25% of falls resulting in fracture, laceration, or the need for hospital care (Rubenstein and Powers 1999 in Lord et al 2001).

Gender and ethnicity differences

Results have been contradictory as to whether older women fall more frequently than older men or whether white people fall more frequently than
non-whites (Tinetti 1998) Women appear to have higher rates of both fracture and non-fracture injuries than men, while whites have a higher rate than non-whites (Cummings et al 1985; Fitzgerald et al 1988).

**Active and inactive lifestyle**

While falling and fall-related injury are more common amongst frail older people, it is important to note that healthy older people who engage in challenging physical activities are also prone to falling and subsequent injury (Koski et al 1998). In fact some research implies that healthy, more active older people are at greater risk of injury per fall than are frailer individuals (Palmer et al 1989). This suggests that falling is not merely a marker of functional decline, but also of behaviour and lifestyle.

**2.3.2 Location of falls**

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).

Lord et al (2001) state that most falls occur on level surfaces within commonly used rooms such as the bedroom, living room and kitchen. However, there is some debate as to the most common locations within the home in which falls occur. According to HASS data, the most common locations for falls in the home among older people during 2000-2002 were the garden (grass, lawn, plant beds), the bedroom, the living room (lounge, study, dining) areas and the kitchen (DTI 2003).

The remaining falls recorded amongst community-dwelling older people occur in public places and other people's homes. For example, commonly reported environmental factors involved in falls in public places include uneven pavements, gutters, steps, uneven ground and slippery surfaces. This is discussed further under 2.4.2.
2.3.3 Consequences

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 varying impairment including injury, psychological distress and restriction of activity. Issues can include anxiety of falling again, restrictions in activity/mobility, and increased need of assistance (Cwikel et al 1990).

Physical Injuries

Between 22% and 60% of older people suffer injuries from falls (Salkeld et al 2000; Lord et al 2001) and recent statistics have suggested that the proportion of people sustaining injuries from a fall is increasing (Kannus et al 1999; 2000). 10-15% suffer serious injuries, 2-6% suffer fractures and 0.2-1.5% suffer hip fractures. The most commonly self-reported injuries include superficial cuts and abrasions, bruises and sprains. The most common injuries that require hospitalisation are femoral neck fractures, other fractures of the leg, fractures of radius, ulna and other bones in the arm and fractures of the neck and trunk (Gibson et al 1987; Lord 1990; Speechley and Tinetti 1991).

For the falls sustained within the home during 2000-2002 that were reported to the HASS database, the most common injuries described were (unspecified) tenderness and swelling, closed (ordinary) fractures, bruises and contusions, and lacerations (RoSPA 2004).

The most serious of these in terms of morbidity and mortality is fractured neck of femur, as older people recover slowly from hip fractures and are vulnerable to post operative complications (Marottoli et al 1992).
However, any fall injury can lead to the downward spiral of disability and decreased mobility. This deterioration in physical abilities often results in increased dependency on other people and further falls. After a continual decline, admission to an institution may result (Tinetti et al 1993; Lord 1994).

Unintentional injury is the sixth leading cause of death in persons over the age of 65 (Cummings et al 1985). The majority of these deaths are attributed to falls, especially among persons aged 85 or older.

**Psychological distress and restriction of activities**

In addition to physical injury, falls also have psychological and social consequences. Fear of falling and the post-fall anxiety syndrome are well recognised as negatives consequences to falls; the loss of self-confidence to ambulate safely can result in self-imposed functional limitations, including hesitancy and tentativeness, with a resultant loss of mobility and independence (Clark et al 1993). It has been found that after falling, 48% of older people report a fear of falling and 25% report curtailing activities (Nevitt et al 1989; Tinetti et al 1994). Tinetti et al (1994) have also found that 15% of non-fallers also report avoiding activities due to a fear of falling.

Therefore, although unmeasured, it is clear that falls have a severe impact on quality of life of older people.

Both psychological and physical injuries can be worsened by situational factors. For example, after a fall a ‘long lie’ may occur; this refers to the faller remaining on the ground for more than an hour after a fall and is a marker of weakness, illness and social isolation and is associated with high mortality rates among older people. Time spent on the floor is associated with fear of falling, muscle damage, pneumonia, pressure sores, dehydration and hypothermia (Mallinson and Green 1985; Nevitt et al 1989; King and Tinetti 1995). Wild et al (1981) found that half those who lie on the floor for an hour or longer die within 6 months, even if there is no direct injury from the fall. It is suggested that approximately 20% of patients admitted to hospital because of a fall had been on the ground for an hour or more (Vellas et al 1987).
Unfortunately, the high incidence of long lies is not unexpected when other studies investigating physical abilities have found that almost half of non-injured fallers are unable to get up off the floor without assistance (Tinetti et al 1993).

2.3.4 The cost of falls

Falling is associated with considerable mortality, morbidity, reduced functioning and premature nursing home admissions (Brown 1999; Nevitt 1997; Tinetti 1986). The cost to individuals and society is great and likely to increase in line with general ageing of the population.

In addition to the pain, misery and loss of confidence experienced by older people injured through falling, falls impose a substantial burden on health care services, relatives and society. Fall-related costs can include the direct costs such as doctor visits, acute hospital and nursing home care, outpatient clinics, rehabilitation stays, diagnostic tests, medications, home care, home modifications, equipment and institutional care. Indirect costs can include carer and patient morbidity and mortality costs.

There is little information available in the literature on the total cost of falls as there are many difficulties and limitations involved in estimating the economic cost of any disease or condition.

One recent research study by the University of York (DTI 2000a) has estimated the financial cost of a single hip fracture on society at approximately £25,000, once the full range of costs has been taken into account. The York study estimated a total cost of hip fractures in the UK at £726 million per annum.

2.3.5 Section summary: Nature and scale of the problem

The literature has a strong understanding of the nature and scale of the falls problem, with many studies having been conducted to examine extent of the issue. However, the frequency of falls needs to be closely monitored with respect to the continuously increasing size of the older population.
It is interesting to note that although falling and subsequent injury are more common amongst frail older people, healthy older people are also prone to falling and subsequent injury (Koski et al 1998). This, combined with the fact that some research implies that healthy, more active older people are at greater risk of injury per fall than are frailer individuals (Palmer et al 1989), indicates that falling is not merely a marker of functional decline, but also of behaviour and lifestyle. Scant information is noted about the behaviours and physical activities of older people with regard to fall risk.

There is ample information highlighting the locations where falls occur with deductions made as to the reasoning. However, it is still not apparent why half of all fall episodes occur in the home environment. Removing the variable of exposure time, fall rate may be related to the types of activities that are conducted in the home and the ensuing fall risk.

2.4 Risk factors for falls among older people

Predicting persons at risk for falling has become a key research area in the geriatric literature. Several hundred potential risk factors for falling have been identified, although fall incidents are generally multifactorial. Different disciplines working in geriatrics have attempted to classify fall risk into categories. Given that falls are a relentless health problem, there has been significant interest in the area amongst all disciplines within the health care sector. This interest has evolved into much clinical research into causes and possible intervention strategies. The key disciplines have included medics, physiotherapists, occupational therapists, and nurses, with increasing collaboration with podiatrists, chiropodists, dieticians, opticians, ophthalmologists, neurologists, and psychologists. The most influential of these disciplines is the medical fraternity, who feel that intrinsic (or biological) risk factors are the most predominant issue. There is a substantial degree of inter-relationship between risk factors for falling. The risk of falling increases incrementally in strength with the number of risk factors, and people who have
more than 4 risk factors are at particularly high risk (Tinetti et al 1988, Nevitt et al 1989).

Risk factors for falls are commonly split into categories of intrinsic and extrinsic risk. Intrinsic factors are defined as age and disease related changes within the individual that increase the propensity for falls and subsequent injury, e.g. decreased balance ability, disturbed gait, cognitive impairment, reduced strength, impaired vision, illness, and side effects from use of medication. Extrinsic factors are generally classified as environmental hazards that present an opportunity for a fall to occur, including floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting, problems with walking aids and equipment, ill-fitting footwear, sensory surround and feedback (audio and visual), placement of furniture.

Risk factors are also often described as being modifiable (such as muscle weakness, medications side effect, or hypotension) or non-modifiable (such as hemiplegia or blindness) (AGS 2001). Furthermore, risk factors can be described as predisposing or situational (Tinetti 1998). Predisposing factors are the “cumulative effects of multiple age-related changes, diseases, and disabilities that appear to predispose to falling” (Tinetti 1998). These include any affection to the body that affects postural stability. Situational factors can be described as factors that may ‘precipitate’ falls. Tinetti includes factors within the environment, choice of movement by the older person, and ‘acute host factors’ such as dizziness and syncope. Falls are also sometimes discussed in terms of whether or not they present injury (Lamb 2001). Some recent evidence suggests that it may be possible to distinguish people at higher risk of injurious falls, as compared to a non-injurious fall, by one or more factors including: low body mass; impairments of gait and balance; chronic neurological disease; and/or previous falls (Nevitt et al 1991; Tinetti et al 1995a; Davis et al 1999). This is seen as an important development within the health care profession, as it may herald the development of more cost-effective methods of targeting high-risk groups.
This section has introduces the risk factors for falls among older people with the use of the most common categories. These groupings are intrinsic, and extrinsic risk. In order to show the diverse nature of the many contributing issues, other implicated risk factors which have been comparatively under-investigated, are also discussed. These include behavioural risk factors.

Each category of risk factor is explained, with evidence from the literature justifying the extent of each factor in fall risk. The section is then summarised and the strengths of association of risk factors currently understood to be involved in falls are illustrated.

2.4.1 Intrinsic risk factors for falling

These factors involved in falls are intrinsic to the individual and 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). Research has estimated that intrinsic risk factors play a role in approximately 50% of falls amongst a combined group of institutionalised and community dwelling older people (Rubenstein et al 1996). Frail older people with multiple chronic illnesses suffer more fall episodes than their healthier counterparts (Tinetti 1986). Therefore, many falls may occur due to clinically identifiable causes. This section discusses the contribution of common medical conditions to risk of falling among older people.

Age and gender

Falls are generally considered to be indicators of frailty and immobility and so are associated with advanced age and restrictions of activities of daily living (ADL). The majority of studies investigating falls among community dwelling older people have illustrated a higher incidence rate among females (Lord et al 2001). This finding may be due to reduced strength (Lord et al 1994) and poorer step reaction time in women (Lord et al 1999). These differences could to some extent be due to the inconsistent ratios in the measured populations, Figure 2.2. However, in hospitals and residential homes where the inpatient
population are comparable, the incidence of falling is similar for males and females (Lord et al 2001).

![Figure 2.2 UK estimates of the frequency of falls in the home among older men and older women (based on data in DTI, 1999, 2000; 2003)](image)

**Impaired balance and gait**

Deterioration of balance is often reported to be one of the major contributing risk factors to falling in older people (Tinetti et al 1995). Postural stability can be described as the ability of an individual to maintain the position of the body (its centre of mass) within specific boundaries of space, referred to as stability limits (Lord et al 2001). Stability limits are boundaries in which the body can preserve its position without altering the base of its support (Shumway-Cook and Woollacott 1995).

In order to maintain postural stability, sensory information about the location of the body comparative to the environment and the capacity to produce forces to control body movement need to be integrated. Vision, vestibular sense, speed of reaction, proprioception, neuromuscular control and muscle strength are all involved in postural stability. Neurological processes link the
systems together enabling movements to be planned and executed (Shumway-Cook and Woollacott 1995). Dependent on the demands of a specific task, the systems involved in balance will need to adapt. Normal ageing is associated with deterioration in these adaptation processes, resulting in postural instability. This can mean that a person is likely to fall as they are unable to recover from postural challenges in daily life (Lord and Ward 1994).

Postural stability when standing still

During normal standing the body is subject to small amounts of postural sway (also referred to as body sway), defined by Sheldon (1963) (in Lord et al. 2001) as "the constant small deviations from the vertical and their subsequent correction to which all humans are susceptible to when standing upright". The aged body generally has increased postural sway due to a decline in sensory functions, which is most marked over the age of 80 (Boman and Jalavisto 1953 in Lord et al 2001). Various balance testing techniques have been developed to investigate the association between postural control and fall episodes among older people, including sway meters, optical systems and force platforms (Baloh et al 1998). There has been much published to associate increased postural sway with falls (Overstall et al 1977; Fernie et al 1982; Lord et al 1994). Factors found to be highly related to increased sway are summarised in Table 2.1. It has been observed that postural sway is significantly greater among those who fall one or more times per year than those who do not (Fernie et al 1982). There are also interesting positive relationships between subjective measures of postural instability and objective postural sway, feelings of instability, and fear of falling (Downton and Andrews 1990)
Table 2.1 Factors positively correlated with increased sway (hence risk of falling)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced lower extremity muscle strength</td>
<td>Lord et al 1991a; Judge et al 1995</td>
</tr>
<tr>
<td>Reduced peripheral sensation</td>
<td>Duncan et al 1992</td>
</tr>
<tr>
<td>Poor near visual acuity</td>
<td>Lichtenstein et al 1988; Lord et al 1991a</td>
</tr>
<tr>
<td>Slowed reaction time</td>
<td>Stelmach et al 1989; Lord et al 1991</td>
</tr>
<tr>
<td>Vestibular function</td>
<td>Lord et al 1991a; Cohen et al 1996</td>
</tr>
<tr>
<td>Low body mass</td>
<td>Lichtenstein et al 1988; Era et al 1996</td>
</tr>
<tr>
<td>History of falling</td>
<td>Ferme et al 1982; Cho et al 1998</td>
</tr>
<tr>
<td>Increased risk of falling</td>
<td>Lord et al 1991b; Lord and Clark 1996</td>
</tr>
<tr>
<td>More challenging conditions (e.g.</td>
<td>Lord et al 1991b; Lord and Clark 1996</td>
</tr>
<tr>
<td>reduced stability limit)</td>
<td>Kirby et al 1987; Day et al 1993</td>
</tr>
</tbody>
</table>

Postural stability when moving

In order to keep one's balance when moving (e.g. walking) considerable engagement of the postural control system is required, which presents more of a challenge to the body. This is particularly the case for older people where the aged body has met a decline in sensory function and muscular strength. These waning abilities often result in a change in gait pattern. For example, a slower walk, a shorter step length, and/or an increase in time spent in double limb support are common, as are reduced hip motion, reduced ankle power and motion, and reduced medial toe pressure (Lord et al 2001). These changes tend to indicate that a person has adopted a more conservative and secure gait (Woollacott and Tang 1997). Therefore, particular changes in gait pattern may be foretelling of falling in older people (Lord et al 2001) although further clarification is required from this area of research which currently has inconsistent findings (Hausdorff et al 1997; Maki 1997).

During leaning tasks, postural control is challenged and sway increases (especially when leaning forwards), suggesting difficulty in stabilising posture when getting close to the outer confines of the stability limit (Hasselkus and Shambes 1975). The functional reach test was developed to examine a
person's ability to reach forward as far as possible with the arm outstretched at 90 degrees from the trunk (Hagemon 1995). The results of this test show that with age there is a reduction in mean reach (Hagemon 1995). Further research into functional reach has related the test to performance in activities of daily living and a predictor of falls (Duncan et al 1992; Weiner et al 1992).

**Musculoskeletal problems**

The changes in flexibility, strength, posture, gait and pain are influenced internally by biological aging and disease. These factors can also be influenced by functional changes in the lifestyles of older people. Reduced muscular strength in the lower limbs (Nevitt et al 1989; Campbell et al 1997; Davis et al 1999) and hands (Blake et al 1988; Nevitt et al 1989; Campbell et al 1997) is predictive of falling.

**Loss of flexibility**

The change in flexibility as a person ages can be the result of the change in collagen, dietary deficits, hypokinesis (see 2.4.2), the effects of arthritis, or a combination of these. A loss in flexibility compounds problems such as difficulty in walking and ability to complete activities of daily living. Collagen is the main supportive protein in skin, tendon, bone, cartilage and connective tissue. As it ages, collagen changes shape resulting in less linear pull on the tendons, bones etc, resulting in decreased mobility. Poor nutrition may contribute to collagen changes, particularly Vitamin C deficiency (Robertson 1971; Schneider 1983).

**Arthritis**

There are many forms of arthritis but the most common to limit the older population are osteoarthritis, rheumatoid arthritis, and polymyalgia rheumatica. Older people with arthritis often have reduced mobility and difficulty in undertaking tasks of daily living (Gibbs et al 1996). It has already been discussed that the musculoskeletal system is paramount in postural stability, particularly when acclimatising to challenges in the environment (2.4.3). Furthermore, there is some evidence that arthritis impairs balance and sensing of joint positioning (Hurley 1997 and Wegener 1997, in Lord et al 2001). Hence, it is not surprising that both a history of arthritis and self-
reported arthritic symptoms have been associated with falls among older people (Campbell et al 1989; Nevitt et al 1989).

**Foot problems**

Foot problems may be due to a number of conditions including diabetic, dermatological, vascular, and arthritic influences, as well as being affected by poor choice or design of footwear (Chung 1989; Herman and Bottomly 1992). One third of community dwelling older people and the vast majority of institutionalised elderly (85%) are affected by foot problems (Harvey et al 1997). Painful, immobile foot joints can result in impaired gait and balance (Benvenutti et al 1995). However, although there is this link with postural stability, there is no totally conclusive evidence to relate falls to foot problems as very few studies have investigated this area specifically. Instead, foot problems have been grouped into the category of lower extremity problems, which has not allowed the data to be evaluated effectively (Lord et al 2001).

**Diminished proprioception**

The sense of touch, or tactile sensation, has had limited study in relation to aging. There does seem to be some evidence that tactile sensation also decreases with age, although this varies individually (Thornbury and Mistretta 1981 in Lewis 1990). The related sense of kinaesthesia is the person's awareness of his or her body in space. Information comes from the receptors in muscles, joints, and the inner ear, which aid movement, touch and positioning. Decreased kinaesthetic sensitivity in an older person results in postural instability and difficulty in reacting to bodily change in space. Dizziness and vertigo, associated with a fluid imbalance in the semicircular canals of the ear, are common problems with people aged over 50. When combined with dysfunction in kinaesthetic and tactile senses, they increase older people's vulnerability to falls (Wantz and Gay 1981 in Lewis 1990).

**Impaired vision**

As the eye ages, it undergoes many physiological alterations, resulting in deterioration of visual abilities (Pitts 1982) including visual acuity, glare and contrast sensitivity, accommodation, dark adaptation, and depth perception. Low vision can affect daily routines as well as leisure activities. These
consequences often lead people with low vision to become confused and anxious.

**Visual acuity**

Visual acuity decreases with age. Normal vision is described as 20/20; vision of 20/30 means that a person can identify objects at 20 feet that a person with normal vision can identify at 30 feet or less. Vision levels of 20/40 can still be quite functional, e.g. can still drive a car (Lewis 1990). However when vision reaches 20/50 or worse, driving is usually not permitted (Lewis 1990). Recognition of objects and people becomes difficult at 20/70 and less. Approximately one third of individuals over 80 have vision of 20/50 or less (Marmor 1977). Although it may be expected that poor visual acuity would be associated with an increased risk of falling, the research findings have been irregular. Visual acuity was associated with a history of recurrent falls in three large studies of older people (Tinetti et al 1988; Nevitt et al 1989; Ivers et al 1998). However, other research did not find such a relationship (Brocklehurst et al 1982; Campbell et al 1989).

**Depth perception**

Nevitt et al (1989) found that when depth perception was impaired older people were more likely to have reported a fall. Felson et al (1989) reported that in a study investigating hip fractures, individuals with reduced depth perception had higher fracture risk. Evidence suggests that the loss of stereoscopic vision and depth perception increases a person’s chances of tripping, falling, or running into objects such as an open cabinet door, for example (Bachelder and Harkins 1995).

**Contrast sensitivity**

Studies by Lord et al (1991c; 1992b; 1994) and Ivers et al (1998) have all reported that poor contrast sensitivity is more important than visual acuity in predicting fallers. It has been suggested that this is because “an age-related loss in contrast sensitivity is likely to impair a person’s ability to detect and discriminate objects in a cluttered environment” (Owen 1985 in Lord et al 2001).
Accommodation
The lens loses its elastic nature and becomes more rigid. The ciliary muscles that hold the lens in position may become weaker, lose tone, and decrease in ability to accommodate rapidly from near to far distance and vice versa. This is known as presbyopia or old sight. Once the lens becomes unaccommodating, the eye remains permanently focused at an almost constant distance, a distance that varies from one individual to another. In order for an older person to be able to see both near and far objects, they must wear bifocal glasses. There have been no studies investigating accommodation of the eye and falls specifically, although there are links between falls and the use of bifocal spectacles (2.4.4).

As well as age-related visual decline, the older eye can also be susceptible to eye disease such as cataracts, macular degeneration, and glaucoma, which can additionally impact on age-related deterioration, as visual acuity, depth perception and contrast sensitivity are further decreased.

Cataracts
A cataract is a buildup of protein on the lens, which blocks some light from reaching the retina and interferes with vision. In its early stages, a cataract may not cause a problem and the cloudiness may affect only a small part of the lens. However, over time, the cataract may grow larger and cloud more of the lens, making it harder to see. As less light reaches the retina, vision may become dull and blurry. Many people develop cataracts in both eyes. Cataracts tend to grow slowly, so vision gets worse gradually. Approximately 20% of people aged 65 or older develop cataracts, and with many age related conditions, are more common with increasing age (Kahn et al 1977). Cataracts have been associated with an increased risk of falling in older people (Jack et al 1995; Ivers et al 1998).

Macular degeneration
Age-related macular degeneration (AMD) is a disease that affects the central vision. It is a common cause of vision loss among people over age of 60, affecting approximately 10% of over 65 year olds and one fifth of individuals
over the age of 85 years (Mitchell et al 1995). The center of the vision is usually affected, which can make it difficult to perform daily activities that require fine, central vision. The most common symptom of AMD is slightly blurred vision. More light may be required for reading and other tasks, and faces may be hard to recognize faces until very close to them. As AMD gets worse, a blurred spot may be visible in the center of the vision. This spot occurs because a group of cells in the macula have stopped working properly. Over time, the blurred spot may get bigger and darker, taking more of the central vision. People with AMD in one eye often do not notice any changes in their vision. With one eye seeing clearly, they can still drive, read, and see fine details. Some people may notice changes in their vision only if AMD affects both of their eyes.

Few research studies have investigated macular degeneration and falls risk, despite it being the leading cause of blindness among older people in the Western world (Vingerling et al 1995)

**Glaucoma**

Glaucoma is a group of eye conditions in which the optic nerve is damaged at the point where it leaves the eye. This nerve carries information from the light sensitive layer in the eye, the retina, to the brain where it is perceived as a picture. The eye needs a certain amount of pressure to keep the eyeball in shape so that it can work properly. In some people, the damage is caused by raised eye pressure. Others may have an eye pressure within normal limits but damage occurs because there is a weakness in the optic nerve. In most cases both factors are involved but to a varying extent.

Glaucoma affects approximately 3% of people aged 65 and above and has been associated with increased risk of falling among older people (Ivers et al 1998).
Cardiovascular problems

Orthostatic hypotension
Orthostatic hypotension (OH) (or postural hypotension) concerns the drop in blood pressure when moving quickly to a standing position. It has been estimated that approximately one third of the community dwelling older population suffer from this problem (Tilvis 1996), many of whom suffer due to the antihypertensive drugs that they are prescribed (Lord et al 2001). The most usual reason for OH is the breakdown of the autonomic nervous system when reacting to changes in the body’s posture (Mathias 1995) but other causes of OH include heart failure, diabetes, Parkinson’s, stroke, dementia and depression (Tilvis 1996). Although a great deal of time has been spent on research into the area, the little evidence that exists to relate fall risk and OH is contradictory. Several retrospective trials have shown a correlation (Campbell et al 1981; Gabell et al 1985), no prospective investigation has found a positive relationship between OH and fall risk among older people (Salgado et al 1994). This may be due to the different ways in which blood pressure (BP) has been measured, variations in general BP, and interaction of other factors such as medications and overall health (Lord et al 2001).

Blood pressure does vary throughout the day, dependent on the individual. A weak relationship has been discussed regarding post-prandial hypotension (a drop in BP after consuming food) and fall risk (Lord et al 2001).

Drop attacks
Such an attack refers to a sudden, unexplained fall to the ground preceded by turning of the head or tilting of the neck, the cause of which continues to be poorly understood (Lord et al 2001). Drop attacks have been attributed as the cause of up to 25% of falls, suggesting that they are a common cause of falls among older people (Overstall et al 1977).

Syncope
Syncope refers to a person suddenly losing consciousness, and then reviving. It is as a result of carotid sinus hypersensitivity and reduced cerebral blood flow and is a risk factor for (injurious) falls (Crilley et al 1997; Ward et al 1999), although it is relatively uncommon (Kenny et al 2001).
syncope are usually considered to be two separate diagnoses (as they should be according to Gibson et al's (1987) definition of a fall). However, the terms are often mixed with respect to drop attacks and syncope as the aetiology are very similar (Lord et al 2001).

**Neurological problems**

**Stroke**

A stroke, or cerebrovascular accident (CVA), is a sudden loss of brain function resulting from interference with the blood supply to a part of the brain (Lewis 1990). Following a stroke, many older people are unable to produce enough force in the muscles of their lower limbs, or to synchronize the actions of varying muscle groups (Moseley et al 1993 in Lord et al 2001), which may result in decreased walking ability, particularly decreased foot clearance during the swing phase which may result in tripping (Tideikssar 1989). Due to this reasoning, the majority of studies report stroke as a risk factor for falling and injurious falls, and the risk is particularly strong during the first year of recovery (Langhorne et al 2000). In the chronic stages of stroke, risk of falling is likely to be limited to those people who have residual impairments of vision, cognition and gait and balance problems, and possibly to those aged 65 years or over (Malmivaara et al 1993).

**Peripheral neuropathy**

Peripheral sensation and feeling in the lower limbs, along with tactile sensitivity and vibration sense, affect the ability of a person to perceive the orientation and movement of the limbs (Lord et al 2001). Deterioration can occur as part of the natural ageing process, and as a result of many diseases, e.g. diabetes. Due to the importance of peripheral sensation in balance and stability, the evidence suggests that peripheral neuropathy is a considerable risk factor for falls among older people (Richardson and Hurvitz 1995).

**Vestibular pathology**

Postural stability requires strong interaction between the visual, somatosensory and vestibular systems. Therefore, the existence of vestibular problems may weaken posture and gait, impacting on risk of falling.
Vestibular problems are a common cause of dizziness among older people (Kroenke et al 1992 in Lord et al 2001). Most studies report a moderate risk of falling associated with any dizziness that lasts for at least one month (O'Loughlin et al 1993; Tinetti et al 2000).

**Parkinson's disease**

Parkinson's disease affects approximately 2% of people aged 65 and older (Tanner 1992 in Lord et al 2001) and the symptoms are bradykinesia, tremor and muscular rigidity. The gait of a parkinsonian patient exhibits short, shuffling steps, lack of arm swing, loss of trunk movements, and decreased foot clearance (Lewis 1990). Parkinson's disease is associated with a very strong risk of falling due to these issues (Prudham and Evans 1981; Nevitt et al 1989).

**Myelopathy**

Myelopathy is a deterioration of the cervical spine that results in narrowing of the spinal canal. This narrowing often impacts upon the spinal cord, ensuing in spinal cord impingements and postural dysfunction (Lord et al 2001). This 'myelopathy' has been linked to falls due to subjective reporting of associated clumsiness, e.g. difficulty climbing stairs, and objective reports of standing imbalance (Lord et al 2001). Despite these associations, no research has implicated myelopathy as a significant risk factor in falls.

**Ill-effect of medication and poly-pharmacy**

It was estimated over 10 years ago that the majority (85%) of people aged 65 or older take one or more prescribed medication daily, with nearly half (48%) taking 3 or more (Cumming et al 1991). With an increasing older population who are living even longer now, these estimates can be considered modest.

Much evidence has shown that the more drugs taken, the higher the fall risk (Campbell et al 1989; Lipsitz et al 1991). Reasons for this include the relationship between medications and poor health, as well as undesirable interrelations between drugs, incorrect use of medications, and medication side effects (Cumming 1998). The latter include dizziness, sedation, reduced mental alertness, blurred vision, reduced coordination and balance (Lord et al
1995). Relationships have been examined between specific classes of drugs and risk of falling. Drug groups commonly implicated in falls among older people are included in Table 2.2 (after Lord et al 2001).

<table>
<thead>
<tr>
<th>Drug Group</th>
<th>Area of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychoactive medications</td>
<td>Depression and anxiety, sleep disturbances,</td>
</tr>
<tr>
<td>(e.g. hypnotics and anxiolytics, antidepressants</td>
<td>psychosis</td>
</tr>
<tr>
<td>and antipsychotics)</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular system medications</td>
<td>Cardiac failure, hypertension,</td>
</tr>
<tr>
<td>(e.g. antihypertensives, diuretics and</td>
<td>glaucoma, fluid retention</td>
</tr>
<tr>
<td>antipsychotics)</td>
<td></td>
</tr>
<tr>
<td>Anti-inflammatories and analgesics</td>
<td>Arthritic swelling, joint pain, stiffness,</td>
</tr>
<tr>
<td>(e.g. corticosteroid, nonsteroidal anti-</td>
<td>inflammation, gout</td>
</tr>
<tr>
<td>inflammatory drugs, codeine)</td>
<td></td>
</tr>
</tbody>
</table>

**Cognitive impairment**

The commonly recognised psychological risk factor for falls is dementia, which affects 10% of community dwelling older people (Hendrie et al 1998) and is one of the most common reasons for nursing home admission (Lord 1994). It is recognised that dementia increases risk of falling (Asada et al 1996; Ivers et al 1998). The size of risk varies across studies, and this may be related to different methods of measuring cognitive impairment, measurement error, or the prevalence of cognitive impairments across populations. Reasons for the association included that fact that people are prone to wandering as well as changing their gait (Mossey 1985). It is hypothesised that such a cognitive impairment also increases risk of falling by directly influencing an older person’s ability to negotiate their environment and the hazards within (Lord et al 2001).
Other health problems associated with increased fall risk

**Urinary incontinence**
Half of older women and a third of older men suffer from urinary incontinence (Thom 1998). Relationships have been found between urinary incontinence and falls among older people (Tinetti et al 1986; Nevitt et al 1989) and these are thought to be due to postural imbalance when rushing to the toilet or due to slipping on urine (Lord et al 2001). However, it is possible that urinary incontinence does not cause falls, but rather that it often co-exists with other factors of falls and is a sign of general frailty (Tinetti et al 1994).

**Low bone mineral density**
Low bone mineral density is a strong risk factor for fractures after a fall (Dargent-Molina et al 1999) but not for falls specifically (Lord et al 2001).

**Poor hearing**
A loss of hearing may interfere with receiving danger signals from the environment, such as horns or sirens, which may impede safety (Maguire in Lewis 1990), although there is no evidence that directly relates this to fall risk among older people.

**Low body mass index**
A low body mass index (less than 22 Kg/m²) is a strong and independent risk factor for injurious falls (Koski et al 1998; Davis et al 1999). Malmivaara et al (1993) reported high body mass index to be protective against injurious falls.

**Limitation in ADL/ADL**
Dependence in any activity of daily living or reporting difficulty in greater than five activities of daily living are weak risk factors for falling, but stronger risk factors for injurious falls (Nevitt et al 1989; Ivers et al 1998; Davis et al 1999).
2.4.2 Extrinsic risk factors for falling

Environmental or 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; Lord et al 2001). In general, clinicians perceive simple environmental hazards, such as loose rugs to be risk factors for falling. Literature has stated that environment-related risk factors for tripping and slipping are reported to be causal in between 21%-53% of falls (Campbell et al 1990; Lord et al 1993) when investigated by researchers. When older people are asked what caused their falls, environmental factors are reported to contribute to around 45% of falls (Tinetti et al 1988; Nevitt et al 1989).

Environmental risk factors have been considered in this section, and for differentiation have been divided into two sub-sections: features of environment that cause problems, and; products in the environment that cause problems. The interactions between the different categories of risk factor have then been discussed.

Features of the environment and fall risk

The environment has been reported to be a factor in most falls, due to uneven or slippery floor surfaces (including the presence of rugs and mats), tripping obstacles, inadequate lighting, poorly designed or maintained stairs with or without handrails (Hill et al 2000). Other environmental hazards that have been reported include the absence of safety or preventative devices, e.g. night lights and grab rails (Tinetti and Speechley 1989). Therefore, it is apparent that design features of the environment cause problems for fall risk. Suggested interior design features that have been considered risk factors for falls are detailed in Table 2.3.
Floor surfaces

A large amount of time has been devoted to investigating tribology – the friction of different floor surfaces. The majority of this research has been focussed on occupational falls rather than falls among community dwelling older people, although many of the findings can be used to design best practice into the homes of older people. Although little researched, it is highly likely that the surface on to which a person falls affects the probability of injury (Lord et al 2001). Redfern et al (1997) undertook a small research project which investigated the influence of different types of flooring on older people's balance when standing. The study concluded that although more compliant floors such as thick pile carpets are more comfortable for older people and reduce the possibility of a hip fracture if a fall was sustained, the prospect of the carpet to undermine their balance and increase their risk of falling may offset this advantage.

Stairs and steps

Stairs are the part of the home where most major injuries and deaths are reported as occurring in the UK, with the most serious incidents resulting from individuals falling on the stairs (Hill et al 2000). In the UK, approximately 57000 older people attend hospital A&E departments each year due to accidents on the stairs, with fracture injuries more common amongst older people than younger people (DTI 2000). Problems related to the stairs may include poorly designed or absent handrails, steep stairs, narrow stair treads, loose stair coverings, objects left on the stairs, poor lighting, poor eyesight and patterned carpets. Using patterned carpets on stairs appears to cause particular problems, by obscuring the edge of each step (Hill et al 2000).

Temporary hazards

The issue of temporary hazards (e.g. family and friends) have also been investigated. From interviews with a small group of fallers, Connell and Wolf (1997) found that these hazards played a role in a proportion of falls. Whether an environmental hazard is present in the home, is usually down to behavioural choice, decided by the individual. Hazards in the homes of other people have been suggested as a risk factor for falls due to a lack of
familiarity with risk (Lord et al 2001), although this issue has not been investigated.

Lighting
Suitable and adequate lighting is important for older people, especially if eyesight is deteriorating with age, in order that hazards can be appreciated. Sudden changes in lighting levels (e.g. when moving from a brightly lit to a dimly lit room) can have a temporary but negative effect on older people's balance, making them sway more than usual (Simoneau 1999). This has implications for individuals who have reduced sensitivity to light in the retina, as it means that they eyesight does not adapt well to darkness, or to sudden changes of light levels. There is some evidence to suggest that providing nightlights can be beneficial, particularly for recurrent fallers (McMurdo and Gaskell 1991), which emphasises the importance of lighting suitability and adequacy.

However, recent epidemiological studies have reported that environmental risks are not associated with falling. Clemson et al (1996) and Sattin et al (1998) compared the homes of fallers and non-fallers and did not find any significant differences in the number of hazards among the two groups. However, these studies were investigating the state of the environment rather than the actual causes of falls, of which, from an ergonomics perspective, extrinsic risk factors are unavoidably involved in.

Products in the environment and fall risk
Research investigating falls among older people has given little emphasis to products used in the home, and the way in which they are associated with fall risk, e.g. household equipment and personal aids. The few studies that have paid this area some attention are highlighted below.

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.
Table 2.3 Interior design features that contribute to falls
(based on Shroyer 1994 and Lord et al 2001)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Hazardous characteristics</th>
</tr>
</thead>
</table>
| Lighting         | Inappropriate lighting for task being performed  
                  Low level of illumination during evening and night hours  
                  Low colour contrast that reduces visibility of furnishings, floor coverings, wall treatments, and accessories |
| Furnishings      | Inefficient arrangement of furniture, resulting in clutter and obstacles  
                  Low lying furniture components, such as footstools, in traffic paths  
                  Furniture that does not support the weight of the individual when rising from a seated position  
                  Inappropriately designed chairs that do not fit the user  
                  Lack of appropriately installed shower benches in bathing areas |
| Architectural elements | Stair designs that are inconsistent in riser height and tread depth  
                        Absence of safety rails on stairwells and in bathrooms |
| Floor surfaces   | Unsecured floor coverings, including through rugs  
                  Poor maintenance of floor surfaces  
                  Highly waxed floor surfaces or slippery floor surfaces  
                  Irregular, uneven or rough floor/ground surfaces  
                  Thresholds that are not flush with floor surfaces  
                  Hard floor surfaces that can increase injury from a fall  
                  Not installation of non-skid surfaces in bathrooms, baths, and kitchens  
                  Use of dizzying patterns in floor covering  
                  Electrical cords and wires in pathways |

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 (1999) 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, which has interesting implications for risk perception. However, the results also exposed that at sub-optimal positioning, the grab bars can be ineffectual, causing further problems for the user.

A study investigating 300 fall incidences among older people in purpose built accommodation reported that extrinsic factors were causal in half of all episodes (Fleming and Pendergast 1993). Items of furniture and walking aids were the most common factors implicated in these falls.

2.4.3 Interaction between extrinsic and intrinsic risk factors
Northridge et al (1995) found that both frail and healthy older individuals fell due to environmental risk factors in their homes. Interestingly, the study also found that the fall rate of frail individuals was independent of the amount of environmental hazards present. However, differences were noted for healthy individuals; the more hazards present, the higher the reported fall rate. This indicates that environmental risk factors are less important for frailer individuals, possibly because this group are more likely to fall anyway due to an increased intrinsic risk. This reinforces work by Tinetti et al (1988) who
had previously reached a similar conclusion. They split a group of older
fallers into 3 separate groups according to their status of health and found that
the healthiest group associated a larger proportion of their falls to
environmental risk factors (56%), compared to the 'transitional' group and the
frail group, who associated 36% and 29% of falls to environmental risk factors
respectively. It is possible that environmental risk factors are more important
for healthier older people, due to the extent of fall related behaviour and
activity in the home that is dependent on ability. Further research is needed
to determine the role of environmental hazards.

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. However,
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 and is not included in
this model or in the literature in general.
2.4.4 Alternative factors affecting fall risk

Behaviour

The fact that older people play an active role in their exposure to risk and compliance with prevention through their behaviour, has not been considered. 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).

Within an occupational context simple fall-related behaviour has been examined more holistically and to a much greater extent. For example, a fall may result because a person's view of the ground is obscured, due to a number of behaviours, e.g. carrying a load in front of the body (Negata 1993) or not using lighting in dark conditions (Davis 1983). Altering these behaviours may result in safer practice and fewer falls. However, this viewpoint has rarely been used to examine fall risk and causes of falls among the older population. The limited information that is available on the topic of older people's behaviour and fall risk is discussed below.

Hill et al (2000) identified important behavioural factors which affect the risk of older people falling on stairs in the home, e.g. rushing, carrying objects; these findings indicate that behaviour contributes to approximately 35% of falls. It has also been found that behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, affecting confidence and fear of falling.

Hill et al (2000) investigated stair falls and behavioural risk factors and developed a model of the breakdown of types of behaviour, Figure 2.3. This model is a useful tool to use when investigating behavioural mechanisms in falls among older people as types of behaviour are clearly differentiated.
Behaviour is divided into: behaviour affecting the individual; behaviour affecting the home environment, and; direct use of the home. However, the model only includes behaviour and does not show how the other interacting risk factors may predispose individuals to increased fall risk, for example, a person’s abilities and their social situation.

Apart from Hill et al’s work, very little comprehensive coverage has been given to investigating the role of behaviour in falls in any group of older people. However, it has been hinted that it is at least as important that older people change elements of their behaviour as the design of their environment (Easterbrook et al 2001). For example, wearing appropriate footwear may be more important in reducing falls than changing the home environment. Additionally, it has been pointed out that environmental hazards may interact critically with individual behaviour (Connell and Wolf 1997). Specific behaviours that have been investigated are summarized below.
Figure 2.3 Interplay of Behavioural Risk Factors for Falling on the Stairs (Hill et al 2000; Haslam et al 2001)
The consumption of alcohol

With the exception of very high levels of intake, alcohol does not appear to be a risk factor for falling in the elderly (Campbell et al 1989; O'Loughlin et al 1993; Davis et al 1999; Malmivaara et al 1993). Some studies have suggested that a low to moderate alcohol intake will protect against falls (O'Loughlin et al 1993). It has been noted that as people become more frail they tend to moderate their intake (O'Loughlin et al 1993). Further work is needed in this area.

Choice of footwear

There is scant evidence concerning footwear, foot-health and risk of falling. Foot pain and foot conditions are associated with poor balance during complex tests (Menz and Lord 2001). People's awareness of how they position their feet when walking or standing can decline with age, and this can contribute to the frequency of falls in later life (Robbins et al 1995). Some types of footwear can also further impair this awareness of foot position, whilst ill-fitting shoes or slippers, footwear with shiny soles, high heels or loose shoelaces can all contribute to slips, trips and falls. When advising about shoe design, it seems likely that shoes with high collars promote balance, whereas sole hardness does not matter (Lord et al 1999). Although no direct relationships have been found between poor footwear and falls, this factor has been found to affect important risk factors for falls, e.g. balance (Lord et al 2001).

A postal survey of shoe wearing and purchasing habits was conducted by Munro et al (1999) who found that older, community dwelling people tend to wear slippers all day around the home. Reasoning for this was convenience and comfort. The authors concluded that further research is needed to design a household shoe that fits well, accommodated a range of foot pathologies and is comfortable, relatively inexpensive, and safe for typical household surfaces.
Use of spectacles

The use of inappropriate spectacles can reduce depth perception, contrast sensitivity, and visual acuity by a large extent (Lord et al 2001). Although no direct relationships have been found between use of spectacles and falls, this factor has been found to affect these important risk factors for falls. However, there have been qualitative suggestions that the use of bifocal and varifocal eyewear might be a contributory factor for falls on stairs (Haslam et al 2001).

Use of walking aids

Many older people use walking aids at some stage, perhaps whilst an injury heals or due to a decrease in mobility. Individuals may not, however, wish to use such aids and equipment because they can be stigmatising and represent a loss or reduction in walking ability and walking-related elements of independence (Easterbrook et al 2001). Information is needed to understand the use of walking aids and the benefits (or disadvantages) of using such devices.

Participation in physical activity

Over and under engagement in physical activity are risk factors for falling (O'Loughlin et al 1993; Koski et al 1998). Risks associated with activity are specific to the amount and type of physical activity undertaken (Koski et al 1998). Falls from greater than waist height, which involve unfamiliar activities and marked displacement are risk factors for injuries (Nevitt et al 1991; Koski et al 1998; Davis et al 1999).

Hypokinesis, or decreased activity, can cause a person to become less flexible. Older people generally sit for longer periods than do younger people, which can result in a shortening in many of the body’s flexor muscles. This shortening is due to a tightness and change in the collagen. For example, the hip and knee flexor muscles are commonly tight in older people. Gait difficulties and problems in daily inertia may relate directly to tight knee and hip flexors, because of the strength needed to overcome the tightness. Hypokinesis may be the result of poor health, or may be the adopted behaviour of the individual by choice.
Culture and behaviour

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.

Risk perception and behaviour

It is implicit that fall-related behaviour and choice are dependent on perception of risk. One reason that home injuries occur in such high numbers among older people may be hazard perception (Wells and Evans 1996): injuries may occur, to some extent, because of a failure to recognise the existence or severity of potential hazards (Ramsey 1985). For example, older people may misperceive which products or environmental features present risk in the home, which affects their decision to avoid. 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').

**Psychological state**

General psychological state and experience can also have an effect on the individual, affecting confidence and fear of falling. (When examined previously they have sometimes been described as intrinsic risk factors.) 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). Therefore, it does seem that the role of family and friends and links with health professionals may play a role in falls.

**History of falling**

Reporting a fall in the previous year is a strong risk factor for further falls (Wild et al 1981; Nevitt et al 1989; Campbell et al 1997; Ivers et al 1998; Davies et al 1999). As well as a fall being an indicator of physical frailty, there is considerable prior research showing that experience affects perception of risk (Wells and Evans 1996). Watzke et al (1989) found that older people with a history of minor in-home accidents considered bathing and climbing the stairs to be riskier than did those without an accident history. Psychologists have developed an area known as 'behavioural decision theory' to help explain how various biases and heuristics affect people's perception of risk (Wells and Evans 1996). An explanation for the effect of personal experience on the perception of injury risk may be provided by the 'availability heuristic'. According to this theory, people judge an event as more likely if instances of the event are easy to recall or imagine (Tversky and Kahneman 1973).
2.4.5 Section summary: Risk factors for falls among older people

There are several hundred recorded risk factors for causing falls among older people. The strengths of association of risk factors currently understood to be involved in falls are illustrated in Table 2.4.

Many physiological factors considerably and autonomously contribute to the distinction between fallers and non-fallers, signifying that meagre performance in any of these areas inclines older people to falls, and that multifaceted impairments greatly increase the risk (Lord et al 2001). However, it is apparent that intrinsic risk factors can be affected by the individual's choice of action and physical environment. For example, balance is more difficult to maintain in particular environments (e.g. uneven ground) and when conducting specific tasks (e.g. leaning, stretching). Very many studies have investigated intrinsic risk factors with a solid data set outlining the interactions between health and fall risk.

In contrast to intrinsic risk factors, there is little evidence that extrinsic risk factors are primary risk factors for falling, although it is clear that many falls do involve environmental factors. This lack of association may reveal, to some extent, the difficulty in studying temporary or sporadic risk factors.

It is clear, however, that the interaction between an older person's physical abilities and the environment is a most important issue in influencing whether a fall will occur. This interaction is impacted upon by an individual's perception of risk and the type of environmental challenges that people choose to expose themselves to (risk taking behaviour). This is an area lacking investigation in the literature. Initial studies implicate a wide range of behavioural risk factors for falls among older people in the home, but further research is required to understand these fully. As well as behavioural issues, it can be hypothesised from an ergonomics perspective that a range of psychosocial factors play a role in fall risk, although these are currently un-investigated.
Table 2.4 Risk factors associated with falls
(after Lord et al 2001; Gillespie et al 2003)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Strength of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced age</td>
<td>***</td>
</tr>
<tr>
<td>Female gender</td>
<td>**</td>
</tr>
<tr>
<td>Impaired balance</td>
<td>**</td>
</tr>
<tr>
<td>Impaired gait and mobility</td>
<td>***</td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>***</td>
</tr>
<tr>
<td>Slow voluntary stepping</td>
<td>**</td>
</tr>
<tr>
<td>Poor reaction time</td>
<td>***</td>
</tr>
<tr>
<td>Poor visual acuity</td>
<td>**</td>
</tr>
<tr>
<td>Poor visual contrast sensitivity</td>
<td>***</td>
</tr>
<tr>
<td>Poor visual field dependence</td>
<td>*</td>
</tr>
<tr>
<td>Reduced peripheral sensation</td>
<td>***</td>
</tr>
<tr>
<td>Reduced vestibular function</td>
<td>--</td>
</tr>
<tr>
<td>Impaired cognition</td>
<td>***</td>
</tr>
<tr>
<td>Depression</td>
<td>**</td>
</tr>
<tr>
<td>Stroke</td>
<td>***</td>
</tr>
<tr>
<td>Incontinence</td>
<td>**</td>
</tr>
<tr>
<td>Acute illness</td>
<td>**</td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>***</td>
</tr>
<tr>
<td>Vestibular disorders</td>
<td>--</td>
</tr>
<tr>
<td>Arthritis</td>
<td>**</td>
</tr>
<tr>
<td>Foot problems</td>
<td>*</td>
</tr>
<tr>
<td>Dizziness</td>
<td>*</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>--</td>
</tr>
<tr>
<td>Use of 4 or more medications</td>
<td>***</td>
</tr>
<tr>
<td>Poor footwear</td>
<td>*</td>
</tr>
<tr>
<td>Inappropriate spectacles</td>
<td>*</td>
</tr>
<tr>
<td>Home hazards</td>
<td>--</td>
</tr>
<tr>
<td>External hazards</td>
<td>--</td>
</tr>
<tr>
<td>Living alone</td>
<td>**</td>
</tr>
<tr>
<td>History of falls</td>
<td>***</td>
</tr>
<tr>
<td>Inactivity</td>
<td>**</td>
</tr>
<tr>
<td>ADL limitations</td>
<td>***</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>--</td>
</tr>
</tbody>
</table>

Notes:
*** Strong evidence; ** moderate evidence; * weak evidence; -- no evidence
2.5 Methods of preventing falls

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 their general practitioner (GP) or to a hospital accident and emergency department (A&E), having experienced a fall.

There are three key elements to fall intervention which may require different responses (Easterbrook et al 2001): decreasing the number of first falls (primary intervention); minimising injury when people do fall (secondary intervention); and reducing the chances of falling again (tertiary intervention). 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; Easterbrook et al 2001; Gillespie et al 2003).

The primary direct indicator that is usually used 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. The best evidence for the efficacy of interventions to prevent falls should emerge from large, well-conducted randomised controlled trials, although these are not always viable studies in terms of available resources. Useful information can also be obtained from smaller trials, although reviews often exclude such research, particularly if they do not report outcomes of number of falls or
severity of falls. This is because an improvement in a replacement outcome measure does not provide direct verification that an intervention can impact on the clinical outcome of interest (Gotzsche 1999 in Gillespie et al 2003).

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 2003) and evidence tables constructed, resulting in guidelines for the prevention of falls.

These recently published reviews have been summarized in this section (Tables 2.5-2.15), and the findings commented upon. The tables have been grouped under intrinsic, extrinsic, and multifactorial intervention strategies. Following this, there is a discussion of the modification of behaviour in fall prevention and a summary of the intervention techniques.

2.5.1 Intrinsic intervention strategies

Exercise interventions

Exercise is important for older people in order to maintain balance, strength and flexibility, which can ensure that usual activities are safety carried out, and so minimising the risk of falling. It is suggested that in the UK, one quarter of women and 7% of men aged 70-74 do not have sufficient strength and power in their leg muscles to be able to get out of a chair without using their arms, and half of the women in this same age category do not have sufficient muscular strength and power in their legs to be able to climb the stairs easily (Skelton et al 1999).

From the research evidence (Table 2.5), it can be concluded that exercise interventions can improve strength, balance and flexibility in older people, and some evidence that exercise can reduce falls. However, it is important to note that this is true only of particular types of exercise regimes, e.g. Tai Chi.
<table>
<thead>
<tr>
<th>Source</th>
<th>Authors’ Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feder et al 2000</td>
<td>✓ 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.</td>
</tr>
</tbody>
</table>
| Gillespie et al 2003| ✓ A programme of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional, is likely to be beneficial.  
✓ A 15-week Tai Chi group exercise intervention is likely to be successful.  
① The effectiveness of group delivered exercise interventions is unknown.  
☒ Brisk walking in women with an upper limb fracture in the previous two years unlikely to be beneficial. |
| AGS 2001            | ✓ Older people who have had recurrent falls should be offered long term exercise and balance training  
① Tai Chi is a promising type of balance exercise, although it requires further evaluation before it can be recommended as the preferred balance training.  
① Although exercise has many proven benefits, the optimal time, duration and intensity of exercise for falls prevention remain unclear. |
| Lamb 2001           | ① The effectiveness of exercise in reducing falls is unclear.  
☒ Recommendations to increase exercise may increase falls. |
| Scott et al 2001     | ✓ Balance training combined with strength and endurance exercise is effective.  
✓ Tai Chi is the only strategy shown in isolation to be effective.  
☒ Inappropriate regime/intensity level may increase risk, e.g. brisk walking.  
① More research needed to determine appropriate exercises for specific fall problems and populations. |

Notes:  ✓ Evidence shows benefit in reduction of falls,  ☒ Evidence shows no benefit in reduction of falls;  ① More research required as benefit unknown.
Medication review

Medication may be prescribed to tackle older people’s health problems, but may increase their risk of falling if taking the medication adversely affect risk factors for falling. The relationship between medications and falls can be classified in four ways. Some medications may contribute to a fall in an older person because they cause conditions that increase the risk of falling (e.g. sedation, cognitive impairment, blurred vision, impaired balance). This effect may be the primary aim of the medication or may be a side effect of the drug. Secondly, a person’s failure to comply with medication may increase the risk of falling. The extent to which particular medications may be inappropriate for long term use among older patients is another issue. For example, tranquillisers may cause daytime drowsiness. The impact of multiple medications is also an issue for falling; for example, an adverse affect on nutritional needs.

From the research evidence (Table 2.6), it can be concluded that medication review can reduce risk of falls.

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors’ Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gillespie et al 2003</td>
<td>☑ Withdrawal of psychotropic medication likely to be beneficial. ☑ The effectiveness of pharmacological therapy is unknown.</td>
</tr>
<tr>
<td>AGS 2001</td>
<td>☑ 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.</td>
</tr>
<tr>
<td>Lamb 2001</td>
<td>☑ Multifactorial intervention studies including medication management have demonstrated benefit. ☑ Evidence that medication withdrawal alone prevents falls.</td>
</tr>
<tr>
<td>Scott et al 2001</td>
<td>☑ Evidence to support psychotropic drug withdrawal and a reduction in falls.</td>
</tr>
</tbody>
</table>
Nutritional supplements

Supplements can assist in maximising vitamin and mineral intake and reduce susceptibility to fracture following a fall. Nutritional supplements are, therefore, a secondary intervention. With recommended levels of vitamins and minerals that should be incorporated into the diets of individuals, for the older population specific interest has been placed on Vitamin D and calcium levels. This is due to the relationship between low levels of these and the presence of osteoporosis, as well as the fact that the recommended levels of these increase with age (Sahota 2000). Vitamin D can enhance the body’s ability to absorb calcium.

It can be concluded from the reviews (Table 2.7) that uncertainty remains about whether the use of Vitamin D supplements make a significant difference in reducing the incidence of fractures, while there are significant cost differences if calcium supplements are also used.

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors’ Conclusions</th>
</tr>
</thead>
</table>
| Gillespie et al 2003 | ① The effectiveness of nutritional supplementation is unknown.  
① The effectiveness of vitamin D supplementation, with or without calcium, is unknown.  
① The effectiveness of hormone replacement therapy on falls is unknown. |
| AGS 2001       | ② Evidence that the use of HRT, vitamin D supplements, calcium and antiresorptive agents alone do not prevent falls. |
| Scott et al 2001 | ② Medications to enhance muscle strength not shown to be effective.  
③ Bone density studies point to benefits of Vitamin D and biphosphonate alendronate. |
Assistive aids/devices

Walking aids
Walking aids are commonly recommended to older people as a means of increasing their walking ability and decreasing their risk of falling. There are very few intervention studies addressing this issue, but preliminary findings suggest that assistive devices have demonstrated benefit but that their use alone, cannot prevent falls.

Hip protectors
Hip protectors are a secondary intervention and aim to minimise the impact of a fall. They consist of two padded, energy-absorbing shells (or shields) which fit into side pockets on a specially made pair of underpants. When worn correctly, they are designed to cover the proximal femur, and to absorb energy and transfer to the surrounding soft tissues (Mills 1996).

Not all fractures will be prevented if wearing hip protectors, and there is some evidence that the incidence of arm fractures is higher amongst those wearing hip protectors (Kannus et al 2000), although this needs further examination. There are also issues for compliance and comfort (Cameron et al 2000). For example, during a trial of hip protectors in residential accommodation, hip fractures were sustained when hip protectors were not being worn, suggesting issues for actual usage (Lauritzen et al 1993).

It can be concluded from the reviews (Table 2.8) that uncertainty remains about whether the use of hip protectors makes a significant difference in reducing the incidence of fractures.
Table 2.8 Assistive aid intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
</table>
| AGS 2001  | ☑ Multifactorial intervention studies that have included assistive devices (canes, walkers, bed alarms, hip protectors) have demonstrated benefit.  
            | ☐ There is no direct evidence that the use of assistive devices alone prevent falls. |
| Lamb 2001 | ☐ There is no direct evidence that the use of hip protectors alone prevents injury rates. |

Cardiovascular interventions
Cardiac pacing in fallers with cardioinhibitory carotid sinus hypersensitivity has become an area of interest to cardiovascular medical specialists. One recent study (Table 2.9) has now shown cardiac pacing to be beneficial for individuals at risk of falling due to this specific medical problem (Kenney et al 2001).

Table 2.9 Cardiovascular intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gillespie et al 2003</td>
<td>☑ Cardiac pacing for fallers with cardioinhibitory carotid sinus hypersensitivity are likely to be beneficial</td>
</tr>
</tbody>
</table>

Visual interventions
Adequate vision enables older individuals to identify hazards and routes so as to avoid tripping and falling. Visual impairment appears to be a strong indicator of being at risk of falling (Ivers et al 1998; Nevitt et al 1989). However, very few studies have investigated visual interventions and their effectiveness is still unknown, Table 2.10.

Table 2.10 Visual intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGS 2001</td>
<td>☐ The effectiveness of interventions for visual problems is unknown.</td>
</tr>
</tbody>
</table>
2.5.2 Extrinsic intervention strategies

Footwear

Although no direct relationships have been found between poor footwear and falls, this factor has been found to affect important risk factors for falls. There is currently a lack of intervention studies in this area and uncertainty as to whether the use of footwear interventions is beneficial, Table 2.11.

Table 2.11 Footwear intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors’ Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGS 2001</td>
<td>☐ The effectiveness of footwear interventions is unknown</td>
</tr>
</tbody>
</table>

Home assessment

Environmental modification is seen by some as an attractive falls prevention strategy. The modification of domestic hazards with falls in the home has been controversial, despite its apparent legality. More recent research studies have supported such interventions. However, the exact mechanism of the effect remains unclear (Gillespie et al 2003), Table 2.12.

Physical restraints

Restraints can be used to prevent a person from falling, and although their use is controversial, they are commonly used in residential facilities, usually to reduce harm from unsteadiness or wandering (dementia). Restraints include tables to stop a person from getting out of a chair, use of low chairs or beds to prevent a person from standing up, bed rails, and the use of certain medications (Lord et al 2001).

Their use is contentious because as well as reducing autonomy, there is little evidence that they actually reduce the risk of (falls) injury (Rubenstein et al 1996) and may even increase the risk in some cases, e.g. falling whilst climbing over a bed rail.
### Table 2.12 Home assessment intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
</table>
| Gillespie et al 2003 | ✓ Home hazard assessment and modification professionally prescribed for older people with a history of falling is likely to be beneficial.  
✓ The effectiveness of home hazard modification for older people without a history of falling is unknown.                                                  |
| Feder et al 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. |
| 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 et al 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. |

### Table 2.13 Restraint intervention strategies

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGS 2001</td>
<td>✓ The effectiveness of the use of restraints is unknown.</td>
</tr>
</tbody>
</table>
2.5.3 Cognitive and educational interventions

A limited number of studies have investigated the use of educational sessions and social meetings to address fall risk. Often such techniques have been used in conjunction with other types of interventions, e.g. exercise, home assessments. It is unlikely that their use alone are effective and there are mixed conclusions as to whether educational interventions are effective as part of multifactorial intervention programmes. Further work is required in this area, Table 2.14.

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors’ Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gillespie et al 2003</td>
<td>☐ The effectiveness of interventions using a cognitive/behavioural approach alone is unknown.</td>
</tr>
</tbody>
</table>
| AGS 2001        | ☑ Multifactorial intervention studies that have included behavioural and educational programmes have demonstrated benefit.  
                 | ☒ There is evidence that the use of behavioural and educational programmes alone do not prevent falls. |
| Lamb 2001       | ☐ It appears that the use of health education and promotion programmes alone do not prevent falls.  
                 | ☐ The relative contribution and effectiveness of interventions using health education and promotion programmes within multifactorial intervention studies is unknown.  
                 | ☐ The effectiveness of cognitive behavioural interventions is unknown. |
| Scott et al 2001 | ☒ There is little evidence that education programs alone are effective.  
                 | ☑ Interventions using health education and promotion programmes within multifactorial intervention studies may be effective. |
2.5.4 Multifactorial intervention strategies

The earlier tables have focussed on strategies to address specific risk factors. However, as discussed in 2.5.1, many older individuals have multiple risk factors for falls, and every individual has a slightly different combination of problems. Therefore, it is understandable that a multifactorial approach which combines several different types of interventions, may be a superior strategy.

It can be concluded from the reviews that (most) multifactorial fall intervention strategies are likely to reduce falls among older people, Table 2.15.

<table>
<thead>
<tr>
<th>Source</th>
<th>Authors' Conclusions</th>
</tr>
</thead>
</table>
| Gillespie et al 2003     | ✓ 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.                                                                                                                                                               |
| 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.                                                                                                                                   |
2.5.5 The application of behaviour modification to fall prevention

With limited investigation of behavioural risk factors, it is not surprising that very little consideration has been given to addressing behaviour modification as a measure in preventing falls. Where it has been applied, it has been as a small addition to the major intervention, e.g. exercise, home assessment, and not warranted major discussion or evaluation. The studies that have discussed aspects of behaviour modification are described in this sub-section. It can be summarised that further work is required to investigate the contribution of behaviour modification strategies to fall prevention among older people.

Interventions to modify knowledge, attitudes and behaviours

Kempton et al (2000) conducted a trial with older people who were randomly selected due to sustaining fall injuries that resulted in hospitalisation. The intervention consisted of information and advice on fall risk. The results for the intervention group were increased falls knowledge, including the uptake of physical activity and the use of safe footwear, and a 20% reduction in falls compared with the control group. The authors concluded that the promotion of appropriate behaviours, environments and policies can improve fall-related outcomes. They specified that this is the case as long as there is a commitment to the involvement of older people and enough time to allow change to occur.

Home hazard interventions with an aspect of behaviour modification

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.

Fall prevention education
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.

Multifactorial interventions with an aspect of behaviour modification
Van Haastregt et al (2000) conducted a study with community dwelling older people recruited from general practices who all have moderate impairments in mobility or a history of recent falls. A randomised controlled trial was completed with a follow up period of 18 months. The intervention included regular visits from a community nurse to screen for medical, environmental, and behavioural factors causing falls. The intervention also consisted of the nurse giving specialist advice on these areas, and referrals and action with the observed hazards. Interestingly, no differences were found in falls and mobility outcomes between the intervention and usual care groups. The authors concluded that people in the intervention group demonstrated a reduced fear of falling and increased their daily activities compared to individuals in the control group. Therefore, the authors suggest that individuals in the intervention group may have increased their risk-taking
behaviour. The authors also stated that there appeared to be a lack of compliance amongst the intervention group.

Steinberg et al (2000) compared four interventions. A cognitive/behavioural intervention was undertaken either alone (control) or combined with: exercise; exercise and home safety screening, or exercise and home safety screening and medical assessment. The exercise consisted of a monthly one hour class and control consisted of an information package on falls. The intervention strategies achieved 18-40% reduction in the incidence of falling, but the hazard ratios were not significant in any group.

Tinetti et al (1994) conducted a study with older people who had one or more risk factors for falling over the course of one year. The intervention groups received exercise, behavioural and environmental modifications to prevent falls. These included balance exercises, removal of hazards and training on how to get in and out of the bath safely. The control groups received the usual health and social care. Falls fell by 12% in the intervention groups compared with the controls.

In a randomised trial with more than 3000 community dwelling older people, Hornbrook et al (1994) found that a home assessment and advice on modifications followed by a group education, exercise and discussion programme, reduced falls by 11%.

Reinsch et al (1992) found that a general non-targeted education programme involving sessions on exercise, relaxation and health and safety topics was not effective in preventing falls among community-dwellers attending centres for older people.

2.5.6 Section summary: Methods of preventing falls
Due to the scale of the problem of falls among older people, there is a large body of data on fall prevention methods. However, the majority of this research has been focussed on intrinsic intervention. The methods
statistically proven to be successful in reducing falls among particular populations of older people include: multifactorial fall intervention; medication review; certain types of exercise regime; cardiac pacing (for individuals with particular health conditions); home assessment and modification (for individuals who have fallen previously).

Despite studies being undertaken, there is still uncertainty over a number of the approaches. These areas of uncertainty include interventions involving: the use of Vitamin D supplements in reducing the incidence of fractures; and the use of hip protectors.

Some areas have received little attention to date although preliminary findings suggest that they are beneficial. These include the use of walking aids/assistive devices. Additionally, very few studies have investigated visual or footwear interventions or the use of educational sessions and social meetings to address fall risk, and their effectiveness is still unknown. However, there is little evidence that restraints reduce the risk of (falls) injury, and it is suggested that their use may even increase the risk in some cases.

With respect to behavioural modification strategies, their use alone is rare, and they are more often incorporated into multifactorial fall prevention initiatives. Therefore, their effectiveness is uncertain and further work is required to investigate the contribution of behaviour modification strategies to fall prevention among older people.
2.6 Policy approaches

Due to the phenomenal costs, to both the health care system and to older people, the UK government has been committed to reducing the incidence of falls since the early 1990s. This section describes recent and current policy in the UK with respect to falls and fall prevention among older people.

2.6.1 Healthy Intentions

In 1992, the Health of our Nation described the intention to reduce the death rates of older people following accidents by one-third between 1990 and 2005 (Department of Health 1992). Several years later the White Paper Saving Lives: Our Healthier Nation continued the theme and set targets to reduce the rates of serious injury by at least one-tenth by 2010, alluding to accidents in the home among older people as a considerable concern (DoH 1999).

Since then, strategies to tackle falls and subsequent injuries have become an important policy issue for the National Health Service (NHS), local authorities and other organisations (Easterbrook et al 2001). The Government will have invested an extra £1.4 billion in services for older people in England by 2004, in order to improve the health and social care services for the older population. This policy is in the guise of the National Service Framework for Older People (NSFOP) for England, (DoH 2001).

2.6.2 The National Service Framework For Older People

The NSFOP (England) was launched on 28 March 2001 (DoH 2001). The framework presents eight standards which focus on: eliminating age discrimination; person-centred care; intermediate care; general hospital care; stroke; falls; mental health in older people and promoting an active healthy lifestyle in older age. The NSF provides important opportunities for developing services centred on the needs of older people, by setting standards of service delivery for implementation at a local level. The framework aims to ensure:

- High quality care and treatment, regardless of age
- That older people are treated as individuals, with respect and dignity
• Fair resources for conditions which most affect older people
• Easing of the financial burden of long term residential care

The NSFOP asserts rightly that older people have the right to the highest quality healthcare. The framework also challenges the healthcare professions to deliver this so that older people can live full and active lives, with minimal pain and disability and optimal independence and dignity. Delivering this will be challenging, however, because: older people are the largest consumers of healthcare; the prevalence of multiple pathologies increases with age; and the number of people living longer has increased and will increase further over the next 2–3 decades. In addition, delivery will have to be performed with finite healthcare resources, necessitating the best use of available resources.

Standard 6 (Falls) of this NSF promotes the health and social care service responses to be adopted for older people who have already fallen. Standard 8 (The promotion of health and active life in older age) of this NSF is also likely to be highly relevant in developing fall prevention strategies.

The NSFOP – Standard 6: Falls

The NSFOP identifies falls as a particularly significant health problem for older people (DoH 2001), together with stroke and mental health conditions. Standard Six (shown in Figure 2.4) is devoted to the prevention and management of falls, although falls present as an issue in a number of the other standards.

Two main approaches to fall prevention and management are outlined; a population and individual approach. The population approach requires collaborative action between the NHS and local councils to increase general levels of participation in weight-bearing and strength enhancing physical activity, reduce smoking, promote healthy eating, and minimise environmental hazards. The individualised approach requires that people who have fallen or are considered at high risk of falling be managed by a specialised falls prevention service.

65
National Service Framework for Older People  
Standard 6 - Falls

Aim:
To reduce the number of falls which result in serious injury and ensure effective treatment and rehabilitation for those who have fallen.

Standard:
- The NHS, working in partnership with councils, take action to prevent falls and reduce resultant fractures or other injuries in their populations of older people.
- Older people who have fallen receive effective treatment and rehabilitation, and, with their carers, receive advice on prevention through a specialised falls service.

(DoH 2001)

Figure 2 4 Standard 6 of the NSFOP

NSFOP recommendations for services

An important aspect of the NSFOP is that it establishes plans for the organization of specialist services, which, according to Standard 6, are aimed primarily at those people who have already fallen. These specialist services are designed as Falls Clinics. The NSFOP states that the older people who are eligible to attend are those who have fallen, especially who have: had previous fall fractures; have attended A&E due to a fall; have called an emergency ambulance having fallen; have 2 or more intrinsic risk factors in the context of any fall; have frequent unexplained falls; fall in hospital or in a nursing or residential home; live in unsafe housing conditions; or, are very afraid of falling.

The recommended specialist services are assessment aimed at: identifying risk factors for falls, including health issues and aspects of the home environment; establishing how the person coped following previous falls; identifying any psychological consequence of the fall that might lead to self-impose restriction of activity; and, investigating and treatment for any osteoporotic risk.
It is proposed that, following assessment, interventions should be agreed with the older person and could include: diagnosis and treatment of underlying medical problem; rehabilitation; repairs, including improvement and adaptations to the older person's home; and, social care support.

The NSFOP suggests that falls clinics should be staffed by: a consultant in old age medicine; physiotherapists; nurses; occupational therapists; social workers; pharmacists; chiropodists/podiatrists. It is recommended that clinics should also have access to dieticians, optometrists; audiologists; ophthalmologists; orthotists; and, trained multi-lingual co-workers to reflect the needs of the local population.

The guidelines establish that all local health and social care systems should have falls clinics in place by April 2005 (DoH 2001).

**Critique of the NSFOP**

Although it is understandable in terms of cost and demand, it is unfortunate that the NSFOP does not recognise the great need for assessment of all older people at risk of falls and fall related injury. As it only takes one fall to seriously injure an individual's physical and psychological well being, it is imperative that older people who have not yet fallen, and who are at high risk, are targeted as appropriate.

The overall aims and the holistic approach of the NSFOP are plausible for professionals and older people alike, and the guidelines on how to establish specialist services are encouraging. However, there is very scant detail of tools that should be used at the clinics and the tests that should be carried out. Although this lack of detail allows variety and a multitude of original approaches, it could be that this lack of clarity and reinforcement result in inadequate schemes being developed. It is also just being realised that a coordinated falls strategy requires inter-professional working, pulling together not just primary and secondary care and social services, but also the voluntary sectors, ambulance services, pharmacists, housing department, therapists, patients and carers. This again, is an extremely challenging
process to deliver when there is little instruction on how to do it. When a new target is brought into an already stretched system, it is imperative that as much guidance is given as possible. Given the constraints of time and money it is likely that such important organisational links are weakened by the heavy demand being placed elsewhere on the development of tools and assessments etc. However, this sketchy framework is probably due to the policymakers being uncertain as to the best advice to give, which again highlights the difficulties in combating falls among older people.

Although the recommended specialist service assessments are aimed to be far-reaching and all-encompassing, they are based on a medical framework for assessing and managing falls (2.6.3), which has its own fallacies.

When considering prevention of falls in older people, any service development must be supported by ongoing audit and evaluation. Interdisciplinary working is almost certainly the way forward and collaboration between academics and those responsible for delivering a service is vital to further strengthen and expand the existing evidence base (Close 2001). However, to date, there has been little assessment and auditing of the progress of the NSFOP in use in health care settings. The limited assessment that has been undertaken suggests that there is little evidence of a broad multidisciplinary approach. This raises questions about the effectiveness of many fall prevention initiatives, with the multifactorial nature of falls demanding a more collaborative, inter-professional approach than is evident (Hughes 2002).

It is a cause for concern that the introduction of the NSFOP does not guarantee the adoption of such strategies. Recent research has cited that the introduction of policies is a reason for engagement in fall prevention in only a small number of cases (Hughes 2002).
2.6.3 The assessment and management of falls

The recommendations for assessment have come from epidemiological studies demonstrating an association between risk factors and falls as well as from experimental studies in which assessment followed by intervention demonstrated benefit. A suggested assessment published in a joint collaborative document by the American Geriatrics Society (AGS), the British Geriatrics Society (BGS) and the American Academy of Orthopaedic Surgeons, Panel on Falls Prevention, describes (from a medic's viewpoint) what needs to be done to understand an individual's risk factors and apply an intervention(s). The algorithm is shown in Figure 2.5.

Critique of the assessment

This model does not take into account anyone who has not yet fallen (only to classify them as 'no falls, no problem') which seems to be missing out on a large chunk of the older population the majority of which who will, undoubtedly, soon be predisposed to fall risk. With current and previous successful educational awareness campaigns, e.g. anti-smoking and exercise campaigns, it is clear that drives such as these are not targeted solely at smokers or obese individuals; they are targeted at the population as a whole to prevent further smokers/couch potatoes emanating from the populace, to raise overall general awareness and to use this knowledge to help reduce the problem as family and friends may have an impact on the smoker/obese person. Despite this downfall, the authors of the AGS/BGS collaborative do at least agree that intensity of assessment varies by target population, and prior to intervention, assessment of an individual's risks and deficits is required to determine specific needs.

To the detriment of this medically written assessment process, only intrinsic and extrinsic fall risks have been considered. The fact that older people may play an active role in their exposure to risk and compliance with prevention through their behaviour, has not been considered.
Figure 2.5 Algorithm summarising the assessment and management of falls (AGS 2001)

2.6.4 Section summary: Policy approaches

There is recognition at policy level about the serious implications of falls among the older population, for health care providers and society. Therefore, strategies have been developed to prevent and manage falls. These approaches are orientated towards multifactorial responses including the identification of risk factors for falls and the confirmation of how a person coped after previous falls. Following assessment, interventions may include:
diagnosis and treatment of underlying medical problem; rehabilitation; repairs, including improvement and adaptations to the older person's home; and, social care support. The NSFOP suggests that falls assessment clinics should be staffed by a variety of different professionals to be able to dispense a range of advice. These multifactorial approaches are beneficial, although they still do not consider the fact that older people may play an active role in their exposure to risk. Additionally, there is little in the way of audit and evaluation of the suggested processes and a lack of suggested mechanisms for developing such management strategies. Therefore, it is uncertain as to whether the guidelines are useful and whether their implementation has made any real impact in promoting fall prevention strategies.

2.7 Chapter summary and implications for project research

Falls are a major problem for older people. The large number of falls amongst 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. However much work is still required to examine these further. Policy decisions have been made with respect to fall prevention and management and initiatives set up, although they are, as yet, unevaluated.

There is ample information highlighting the locations where falls occur with deductions made as to the reasoning. However, it is still not apparent why half of all fall episodes occur in the home environment. Removing the variable of exposure time, fall rate may be related to the types of activities that are conducted in the home and the ensuing fall risk. Therefore, the types of activities that are undertaken in the home require further examination.

It is interesting to note that although falling and subsequent injury are more common amongst frail older people, healthy older people are also prone to falling and subsequent injury (Tinetti et al 1988; Northridge et al 1995; Koski et al 1998). This, in combination with the suggestion that healthy, more active
older people are at greater risk of injury per fall than are frailer individuals (Palmer et al 1989), indicates that falling is not merely a marker of functional decline, but also of behaviour and lifestyle. Scant information is noted about the behaviours and physical activities of older people with regard to fall risk.

It is possible that environmental risk factors are more important for healthier older people, than for frail, due to the extent of fall related behaviour and activity in the home that is dependent on ability. Furthermore, it has been noted that if a hazard is present in the environment, it is usually due to the choice of the individual (Connell and Wolf 1997). 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 and has not been discussed in the literature. Further research is needed to determine the role of environmental hazards and risk taking behaviour.

Therefore, it can be suggested that the interaction between an older person's physical abilities and the environment is an important issue in influencing whether a fall will occur. However, indicators suggest that this interaction is impacted upon by an individual’s perception of risk and the type of environmental challenges that people choose to expose themselves to (risk taking behaviour). This is an area lacking investigation in the literature. Initial studies implicate a wide range of behavioural risk factors for falls among older people in the home, but further research is required to understand these fully. As well as behavioural issues, it can be hypothesised from an ergonomics perspective that a range of psychosocial factors play a role in fall risk, although these are currently un-investigated.

There is a keen and developing interest in fall prevention, although the majority of the research has been focussed on intrinsic intervention. There remains a degree of uncertainty over a number of the approaches, including the use of walking aids/assistive devices, and visual and footwear interventions. Additionally, very few studies have investigated the use of educational sessions and social meetings to address fall risk, and their
effectiveness is still unknown. With respect to behavioural modification strategies, their use alone is rare, and they are more often incorporated into multifactorial fall prevention initiatives. Therefore, further work is required to investigate the contribution of behaviour modification strategies to fall prevention.

The recent policy initiatives appear to contain much useful scope although they are currently unevaluated. It could be suggested that a useful direction to take would be towards the examination of the perceptions of health professionals in the active prevention of falls among older people.
Chapter 3

A PRELIMINARY INVESTIGATION INTO THE CONTRIBUTION OF BEHAVIOUR TO FALL RISK

3.1 Introduction

3.1.1 Outline of research presented in chapter

This chapter describes the findings of focus groups* with older people used to obtain preliminary information and background on behaviour in the home in relation to fall risk. Focus groups were chosen as a method to access a wide range of people and their differing perspectives. Areas under discussion included 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, and examination of the value and acceptability of preventative measures.

Risk factors have been identified and their relationships summarised. The chapter discusses the affirmative role of behaviour under the headings of the model developed by Hill et al. (2000), and summarises all the risk factors in a diagram. This qualitative data suggests that behaviour plays a key role in fall risk among community-dwelling older people.

3.1.2 Aims

The aim of this initial study was to collect information on patterns of behaviour around the home likely to affect risk of falling, in order to develop a detailed home interview methodology. The specific objective of this chapter was to:

- obtain preliminary information and background on behaviour in the home in relation to fall risk

* The main findings of this work were presented in abstract form at the Annual Conference of the Ergonomics Society, Cirencester, April 2001 and at the 2nd UK Falls and Postural Stability Conference, Royal College of Physicians, London, Sept 2001.
3.2 Methods

The study used discussion-based focus groups as an effective method of gaining insight into the problem (Morgan and Krueger 1998).

A focus group is a style of group interview whereby the data obtained arises from the interaction and discourse generated from within the group (Morgan 1997). Topics are supplied by the researcher who acts as a moderator for the discussions.

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. Focus groups are commonly used in market, research, social science and human factors research (Bruseberg and McDonagh-Philp 2002).

3.2.1 Sampling

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.

Participants formed five groups, each group meeting on a separate occasion. Three of the groups were of mixed gender, although differed in respect to the mean age of each group; "young old", "middle old" and "older old". 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.

3.2.2 Procedure

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 (the researcher). 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

3.2.3 Data collection

The focus group discussions were recorded, with the consent of the participants, and recordings subsequently transcribed. Partial transcription was undertaken of key discussion points. Initial concepts adopted to categorise the data were the concepts developed in the Hill/Haslam model (Hill et al 2000, Haslam et al 2001). Subsequent data analysis involved the researcher identifying any other concepts within the data and classifying these into appropriate categories using basic content analysis. Partial validation of the results was performed through other members of the research team reviewing the data and interpretation.

A questionnaire was administered at the end of each focus group session (Appendix A) to gather information on each individual's age, type of accommodation, health indicators and fall history. Additionally, information leaflets published for the DTI ASTBH campaign were issued to each participant and any comments on these were noted.
3.3 Results

3.3.1 Participant Information

The sample consisted of 13 male (43%) and 17 female (57%), with ages ranging from 65 to 85 years (mean = 72.1, standard deviation = 5.6). 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 3.2.

Table 3.1 Gender and age composition across focus groups

<table>
<thead>
<tr>
<th>Group Number</th>
<th>Number of participants</th>
<th>Male (N)</th>
<th>Female (N)</th>
<th>Mean age (years)</th>
<th>Standard deviation of age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>69.0</td>
<td>4.0</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>76.5</td>
<td>4.7</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>66.5</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>72.6</td>
<td>6.0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>71.6</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Table 3.2 Descriptions of participant accommodation

<table>
<thead>
<tr>
<th>Type of Accommodation</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached</td>
<td>26.7</td>
</tr>
<tr>
<td>Semi-Detached</td>
<td>50.0</td>
</tr>
<tr>
<td>Terraced</td>
<td>10.0</td>
</tr>
<tr>
<td>Other</td>
<td>13.3</td>
</tr>
<tr>
<td>House</td>
<td>70</td>
</tr>
<tr>
<td>Bungalow</td>
<td>17</td>
</tr>
<tr>
<td>Flat</td>
<td>13</td>
</tr>
</tbody>
</table>

The majority of participants' homes (93%) had a garden and internal stairwells (80%). Almost two thirds of all homes (63%) contained other steps or stairs as part of their design (e.g. a step down into the kitchen etc.)
Over half (60%) of focus group participants were on at least one prescribed medication daily for health problems and 60% of participants reported having fallen in the last 2 years prior to participating in the focus group.

Significance tests were conducted in order to examine whether any relationships were present between age, type of accommodation, fall history etc. The Chi$^2$ test was used to assess relationships and their significance. Significance was shown at a p value of 0.05 or less.

No significant relationship was found between increasing age and increasing fall history, or between gender, medication, stairs, type of accommodation, and fall history.

3.4 Results of focus group discussions

The results have been considered under three categories, using the model developed for the research on fall-related behaviour on stairs (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.

3.4.1 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.”

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’re 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.”

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.

“I tended to jerk and run when the phone went – now I’ve got lots of phones – cordless are good – to carry around with you and are there in case you have a fall – answer phone and 1471 are useful too.”

“Sometimes I start rushing around trying to find my glasses, I waste time finding them, I then sort out what I was going to do, and I hurry off to do it. Due to this rushing and lack of concentration (grumpiness) I might have an accident like a fall or trip.”
Housework

A number of participants reported that cleaning around the house, particularly around the stair area, became 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."

"I keep the vacuum upstairs in the bedroom. When I want to clean downstairs I have to carry it downstairs. That’s the problem with any cleaner. I wouldn’t mind having one upstairs and one downstairs. That stretchy hose is awkward to carry too – it could be a trip hazard."

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 practicing dangerous or unsafe behaviours regardless. This seemed 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. Many reasons were offered in support of this, including health issues (dizziness, vertigo), knowledge about the risk of falling, and reduced self 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 gaining access to the loft space. Several of the participants reported that they still went 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 in relation to falling. This appeared to be dependant on the anthropometry and fitness of the individuals concerned.

"I can reach what's on the top shelf but most of my stuff seems to be down below and I either have to kneel or bend right down to get in there, so I tend not to use the bottom cupboards...you can lose your balance more trying to get stuff out of them. It's not easy or comfy to get down there."

Moving items around the home

Some of the participants would still move furniture around in the home, in order to clean or reorganise, but from their reports they did tend to recognize their own 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.

"I stepped down from the dining room into the kitchen carrying a chair. There was a bit of plastic on the floor and I slipped and fell quite badly. It was just carelessness really, you know."

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, mainly 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).

Several participants commented that they tend to ‘relax their guard in the bedroom’, as they don’t expect to fall there and therefore feel safer. Others mentioned that they tend to be ‘half asleep’ when they’re in the bedroom, due to the majority of the time that’s spent in there being just after one’s risen in the morning, or last thing at night before one goes to sleep. These are opposing reports, however, as being half asleep has implications for increased fall risk.

In the bathroom, participants reported that getting in and out of the bath was 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 (integral to the bath) were 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.

"I can’t get out of the bath – I haven’t got the strength – but I have an ensuite shower cubicle. It’s got a bumpy grip surface."
"I have a bath mat in the bath (non-slip) and a shower over the bath. I feel a bit safer in the bath, 'coz I'm sitting down."

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 by those who participated 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 central role of the kitchen area in domestic life and ‘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..."

Stairs and steps in the home and garden were acknowledged to be a problem with regard to risk of falling. So too were any other changes in level:

"The back door is double glazed and the bottom is raised about an inch. I know it's there, we've had it for years but often I stumble, you forget that it's there."

"A lady I know had a draft coming under her back door, but instead of putting a board onto the bottom of the door to get rid of the draft coming in, she fastened it onto the step, so that every time she opened the door she tripped."

Odd steps and raised areas e.g. thresholds inside the house, caused concern within the group, as did slopes:
"I find slopes are worse than steps, especially when you're not used to the different gradients."

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 increased the risk of falling particularly pebbles and stones.

"I'm always careful going up the garden path coz there are so many cracks – I could quite easily 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."

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.

“I went out of my front door...didn’t see the black ice...it wouldn’t have been so bad but I had trainers on with no grip on the soles. I just went...broke my femur.”

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.

“My son’s dog’s a bit of a nuisance – he’s always round my feet – if the doorbell goes he runs in front of me in a race to get there first. Not being used to it regularly I could fall over him quite easily.”

“My cat’s been trained – but I believe cats can be a problem and trip you over. Dogs always get excited by the bell don’t they.”

3.4.2 Behaviour affecting the home environment

Items underfoot

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'.

"Before my daughter left home, I had great problems persuading her not to leave things on the floor, in the hall or on the bottom of the stairs. Like her handbag with the shoulder strap hanging."

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.

"Rugs tend to ruche up a bit. I am aware of them being a trip hazard"

"I had a rug but I took it up because it wouldn't lie flat and if you weren't careful you caught your foot in it."

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.”

“I got out of bed -- I've got a valance on the bottom of the bed -- I got my foot caught in it and fell with a big bang. I was lucky, I just had some bruising.”

Visitors and visiting

Further sources of items on the floor are those left by visitors to the home, objects that aren't usually there.

“I know I have to be careful after the cleaner has been over. She likes to polish the floor between the lounge and the dining room. I've had lots of near misses.”

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 was also acknowledged as difficult, 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 that some people mentioned was that due to living on their own they would not tackle tasks that they consider risky, because there would be no one else there to ensure that they are safe, or if something went 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:

“I never switch the light on if I get up in the night. I don’t think I’m more likely to fall in the dark – I can still see. I don’t think to put the light on. It’s not that I don’t want to wake myself up. I live on my own, as well.”

“Your eyes adjust to the dark after a bit anyway.”

Some participants thought that they were actually more likely to have an accident if they put the light on:

“If the light’s on and you switch it off, I have to stand still for a moment for my eyes to adjust to the darkness.”

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.

“Under-lit areas can include the side gate area at side of house – those lights with sensors can be good. Especially with pushchairs and grandchildren.”
Equipment and modifications in the home environment

Some of the participants had had changes made to their homes, including extra handrails on stairs and elsewhere around the home, for example, 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."

"I can’t sit on the ordinary chairs so I have a high chair so I can get up out of it more easily. You rock yourself out of it, there’s a lever at the side."

Participants suggested that they would be happy to make other modifications to their homes in order to make them safer with regard to falling:

"I would like to paint white stripes on steps in porch ‘coz a friend has fallen twice on these. Something that you’re not expecting shakes you up more than something that you know is there. Your dignity counts for a lot if you’ve fallen."

"I'd like a handrail on both sides of the stairs – I can’t grip it too well because of my arthritis."

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 used such a device.
3.4.3 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 a large change in threshold had been noticed that 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.”

“I might go upstairs wearing glasses, but before I come down I always take them off”

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 the 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.

“As you get older I don’t think that you lift your feet quite so much when you’re walking, as you do when you’re younger and you do tend to catch your foot on any little bit that’s sticking out. That can be a particular problem with loose carpets in the house.”

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 undertook 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 their GP regarding exercising. Some of this advice was well-received, but some participants were 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. That 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:

"I think there's a reluctance to take on walking aids. In my experience, a huge proportion of men, as soon as they get back on their feet after an illness etc. they don't do what they've been told to do and use a walking stick etc., for a bit. They try to push themselves all the time and won't take on board the fact that having a walking aid is actually going to help them get better quicker. They put themselves at risk."

"I think it's important to have the appropriate type of walking aid for the individual."

**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'.

"When the phone rings or the door bell goes you think oh I've got to answer it and you tend to rush and that's another problem because you're not as careful, mentally I don't think, because you're
concentrating on getting to the telephone or the front door and you’re not thinking about what’s on the way.”

“My elderly aunt has steps between her living room and kitchen etc. where there are fitted handrails for her to hold onto. One thing I have noticed with her is her limited attention span. She has to concentrate so hard about where to put her feet to make sure she doesn’t trip on raised carpet or rugs. But she often starts to do something and forgets to concentrate on her movements.”

**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 slippy, 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.

“I’m a bit of a coward...my light fitting needs a new bulb. It’s been like it for the last 3 months, but I’m not going to climb up on steps to change it. Wait till one of the children comes down; they can fix it for me. I tend to get a bit dizzy these days and I don’t feel confident.”

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.”

Socioeconomic 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."

"I used to cut the hedge in the garden but I've done it for the last time now. I worry about doing it and feel unconfident, so I'd rather pay someone 150 quid to do it. I can afford it though."

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.

"I think some older people begrudge paying out for things they can 'nearly' do themselves. They keep doing the job themselves until they have an accident or a close call."

3.4.4 Advice on falling

Information from health professionals

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.
Information from family and friends

The influence of friends and family was reported to have had an impact on behaviour and choice of activity regarding fall risk. It was commonly reported for a son or daughter to have removed equipment that they thought had an implication for falls:

"My daughter has banned me from going in the loft. She doesn't want me to go up the ladder – she took it away actually, so I couldn't."

Many of the participants had been warned of the dangers by their concerned family and friends:

"I've been instructed not to go up – don't do this and don't do that – my daughter told me not to – don't stand on chairs – it's a good excuse not to clean!"

It was interesting to note that for some individuals, finding out about fall incidents occurring amongst their peers had an impact on their perceptions of risk and their subsequent behaviour:

"I won't let my husband go up ladders anymore. I decided this when two of our friends had falls during DIY activities."

3.4.5 The impact of risk perception on behaviour

The factor that resulted in individuals giving up activities and behaviours that were perceived as 'risky' was dependent on their experience, confidence and personality. For example, according to some individuals who were still happy to ascend ladders, they would stop doing it only after they had experienced a 'close call', and would therefore use their 'common sense':

"There are certain jobs where I think – that's beyond me I'll get a professional in, other jobs I think I'm ok to do."
"There comes a time when you have to listen to the voice inside. You've got to use your own common sense and if it tells you not to do it, you don't do it. But if you can do it and you manage it you feel quite pleased with yourself."

The latter quote emphasises the importance that some older people place on their continued ability into older age and the worth of self-autonomy.

Therefore, it is not surprising that from the discussion it seems that many of the sample still persist in practicing unsafe behaviours, although they understand the gamble that they are taking:

“In the kitchen, you've got your sink and you've got your window. To clean your window you have to climb on your draining board. I still do it – it’s a bit risky now but I still do it. If I asked my son to do it for me, he’d do it, but while I can do it myself I do it still. I’d have a fall and that would stop me – then my son would ask me what I was doing up there.”

“Cleaning windows – stand on chair to do ground floor windows. For upstairs, I sit on the windowsill and put my arm out of the window to clean them. If I had a close call, I’d stop doing it. You don’t like to be beaten when you get older, by not being able to do things. “

However, it was interesting to note that many of the participants said that they would change their behaviour if they had a fall accident, which appears, again, to be dependent on the experience, confidence and personality of the individual concerned and the extent of the incident (a “near miss” fall or an actual fall).

3.5 Discussion
The focus groups have revealed preliminary information on patterns of behaviour around the home likely to affect risk of falling. The investigation
has found out how older people keep and use different areas of their homes, with regard to risk factors for falling. The behavioural risk factors for falls have been examined as the first part of a triangulation approach to examine fall risk factors and perception among community dwelling older people. This information has suggested areas for further investigation and development, which will be undertaken with the use of a detailed home interview programme, the next phase of the project research.

This section summarises the key findings from the focus groups and discusses the interaction of behavioural risk factors. The section then goes on to highlight the key areas for further investigation in the next phase of the project, with implications for future project research. The limitations of the study are then discussed, followed by conclusions from this preliminary examination of falls among older people.

3.5.1 Summary points

The key findings from the focus groups can be highlighted below.

- 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 (Askham et al 1990; Cohen et al 1996; Ivers et al 1998), 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 potentially 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. Regardless of this, the DTI brochures were judged to be informative and interesting, perhaps containing some 'common sense', but nonetheless useful.

3.5.2 Risk factors for falls among older people

As discussed in the review of the literature (chapter 2), the intrinsic, physical capabilities of older people, and to a lesser extent, the environment in which older people dwell, and their mental capabilities, have been highlighted as risk factors for falls. Little investigation has been carried out into behavioural risk factors, with little subsequent discussion. This study endorses these judgments regarding physical, environmental and mental risk factors, but also adds new views from additional qualitative evidence: behaviour has been reported as being a very strong component in fall risk. Furthermore, from the information suggested in these focus groups, there are a selection of additional psychological and peripheral risk factors present that have not previously been considered. All of the currently recognised and newly suggested risk factors have been evaluated using the model developed by Hill.
et al (2000), the framework upon which the results section of this chapter have been written. The issues raised by older people in this study have subsequently been categorised into three types of fall risk: behavioural; intrinsic (psychological; physical; mental; peripheral); and extrinsic (environmental), Table 3.3.

There are many complex interactions occurring between the types of fall risk, which have been summarised in Figure 3.5. It appears that an individual may choose to move about their home in a way that increases fall risk. Additionally, they may choose to design and keep their home in a certain way, or impose an option on themselves that affects their personal limitations. These choices may be due to a lack of awareness of their personal limitations and failure to adjust their behaviour accordingly. However, it appears that these behaviours are all dependent on physical and psychological health, fall history, socio-economic status, pressure and support from family and health professionals, and product and equipment interaction. An individual's behaviour affects an individual's psychological perspective, physical and mental capabilities, and environmental and peripheral influences, each of which in turn have an impact on behaviour and on each other.
<table>
<thead>
<tr>
<th>Fall Risk</th>
<th>Individual Risk Factors</th>
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<tbody>
<tr>
<td>Behavioural Issues</td>
<td>cleaning, bathing, carrying, lifting, reaching</td>
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<td>design, maintenance and state of home (tidiness and habitability)</td>
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<td>non/use of lighting</td>
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<td>poor allowance made for state of physical abilities, e.g.</td>
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<td>continued risky actions such as rushing, carrying, lifting</td>
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<td>misuse of (inappropriate) spectacles</td>
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<td>misuse of (inappropriate) walking aids</td>
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<td>poor choice of clothing and footwear</td>
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<td>use of medications/alcohol</td>
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<td>visitors/pets</td>
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<td>Psychological Issues</td>
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<td>Physical Capabilities</td>
<td>musculoskeletal/neurological/vestibular health</td>
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<td>Mental Capabilities</td>
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<td>Peripheral Issues</td>
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<td>financial and physical support from family, friends</td>
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<tr>
<td>Extrinsic Issues</td>
<td>design and features of environment</td>
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<td>weather</td>
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Figure 3.1 The interaction between behaviour and other fall risk factors
3.5.3 Implications for the next stage of research development

It is suggested that behaviour plays a role in fall risk and the future project research needs to establish the way in which older people perceive fall risk and the types of behaviour that they feel are acceptable and unacceptable. Issues have been raised with respect to the design of the home environment and many products and equipment used by older people, which need to be confirmed in practice.

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. It would be interesting and useful to understand more about the compliance and acceptance factors and to examine how willing individuals are to making new or further changes to their personal environments.

It was suggested that peripheral issues (e.g. sociological conditions) can have an effect on an individual's fall risk and on their perceived safety in the home. Socioeconomic status needs to be compared to an individual's fall history and behavioural practice to see if these initial claims contain any element of truth.

It was found that, on occasion, 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. Why some individuals appear resistant to heeding such advice needs to be examined, as well as issues regarding what makes people change their behaviour, e.g. fall history and previous experience.

It is apparent from previous research (Skelton et al 1994; AGS 2001) that physical ability has a role to play in falls. It would be interesting and useful to examine the relationship between physical measures and types of behaviour.

From the findings of this study, the key issues to be investigated further are summarised in Table 3.4.
Table 3.4 Key areas of future project investigation

<table>
<thead>
<tr>
<th>Topic of inquiry</th>
<th>Area of research interest</th>
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<td>• gender, age</td>
<td>basic information, general health and well being, socioeconomics</td>
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<td>• social situation</td>
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<td>• conditions affecting vision</td>
<td></td>
</tr>
<tr>
<td>• general medical conditions</td>
<td></td>
</tr>
<tr>
<td>• prescribed and non-prescribed medications</td>
<td></td>
</tr>
<tr>
<td>• how do participants behave in the home that might affect their risk of falling, e.g., home maintenance, hurrying, clutter</td>
<td>information on behaviour; assessment of relationship between knowledge and behaviour</td>
</tr>
<tr>
<td>• perception of risk</td>
<td></td>
</tr>
<tr>
<td>• other issues including: footwear, alcohol consumption, behaviour of pets</td>
<td></td>
</tr>
<tr>
<td>• changes in fall related behaviour and safety</td>
<td>information on behaviour and safety changes; assessment of relationship between knowledge and behaviour</td>
</tr>
<tr>
<td>• use of aids and equipment</td>
<td></td>
</tr>
<tr>
<td>• receipt of previous fall safety advice</td>
<td></td>
</tr>
<tr>
<td>• history of falls since age 65</td>
<td>examination of differences in behaviour and attitudes between ‘fallers’ and ‘non-fallers’, examination of behaviour in fall risk</td>
</tr>
<tr>
<td>• participants’ ability to carry out a range of daily activities</td>
<td>measure of self-assessed functional ability</td>
</tr>
<tr>
<td>• height, weight, size of feet</td>
<td>basic information on participants and their functional ability, to compare fall history and behaviour</td>
</tr>
<tr>
<td>• functional ability (‘grip strength’, ‘rise from stool’)</td>
<td></td>
</tr>
<tr>
<td>• vision (acuity, stereopsis)</td>
<td></td>
</tr>
</tbody>
</table>

3.5.4 Limitations of the study

Nature of the sample

Participants in the sample were predominantly women (13 men, 17 women), although to some extent this accords with the greater number of women than men in the older population. Furthermore, older women have an increased risk of falling compared to their male counterparts (Dowswell et al. 1999). Although there were mixed and single gender groups, it did not appear that a higher proportion of males produced any more information about hazards connected with home maintenance activities, for example, as these are more likely to be carried out by men. Furthermore, there did not appear to be any significant differences between the perceptions of the different ages and genders. However, in order to truly establish this, larger sample sizes would
have to be used. Additionally, the groups did not include anyone aged over 85. Although the groups did include individuals with reduced physical abilities, a majority of participants reported that they had little or no difficulty moving around the home environment. It is likely that older and less mobile people, for whom moving around the home would present more of a challenge, may have described different experiences and more problems. For example, it is possible that the emphasis may have been on physical capabilities instead of psychological and environmental issues. Despite these limitations of disposition, the focus groups are still regarded as having provided useful insight and understanding of issues surrounding the interaction of older people within their home environment.

**Approach**

The focus groups resulted in large quantities of data that gave a range and depth of information on fall risk and behaviour. However, the responses are biased toward the opinions of the participants concerned and reflect only the information that the individuals are willing to share; this is a limitation with any research involving people and their ideas and opinions. The former point was remedied as far as possible by removing barriers of formality, putting participants at ease, and by ensuring that aspects of the topic area covered were as far removed from sensitive as possible.

Furthermore, it cannot be assumed that these data are representative of all older people, only that older people with this range of experience and knowledge have generated these data. It may have been useful to increase the number of groups in order to target a wider variety of participants, although it was clear that the methods were capturing the main key points from the sample population, as by the later groups, no new information was coming to the fore.

During the course of the focus group sessions, care was taken by the researcher to moderate effectively. This included ensuring that all participants contributed as equally as possible to the conversation. Care was also taken by the moderator not to bias opinions of participants by prompting the
discussion too much and by allowing the sessions to evolve naturally to some extent.

3.6 Summary and conclusions

Five 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. The issues raised by older people in this study have subsequently been categorised into three types of fall risk: behavioural; intrinsic (psychological; physical; mental; peripheral); and extrinsic (environmental). However, this study does not assist in quantifying the risks and hazards in the home. The issues will be substantiated by using triangulation over the next two chapters.
Chapter 4

HOME INTERVIEWS TO INVESTIGATE FALL-RELATED KNOWLEDGE AND BEHAVIOUR AMONG OLDER PEOPLE

4.1 Introduction

4.1.1 Outline of research presented in chapter

The purpose of the research presented in this chapter was to use an accident-independent approach to collect detailed information on the interaction between behaviour and risk of falling using both quantitative and qualitative techniques. The study was devised to build upon the findings of the focus groups in chapter 3, by establishing the way in which older people perceive fall risk, especially with respect to behaviour. Implications for fall risk have also been investigated with respect to the design of the home and products and equipment, and sociological conditions. The chapter also attempts to examine the attitude of the individual and their willingness to change, and the influence of relatives and friends on older people's behaviour.

A detailed home interview programme with 177 older people was used to collect qualitative and quantitative information on the key behaviours and other risk factors*. Perceptions of risk were summarised and comparisons were made between behaviour and abilities of reported fallers and non-fallers. Although quantitative data analysis showed little difference in behaviours between these two groups, qualitative data suggests that behaviour plays a key role in fall risk.

* The main findings of this work were presented at the Annual Conference of the Ergonomics Society, Cambridge, April 2002 (Brace et al 2002) and at the Triennial Conference of the International Ergonomics Association, Seoul, Korea, August 2003 (Brace et al 2003b)
4.1.2 Aims

The aim of this interview survey was to use an accident-independent approach to collect detailed information on the interaction between behaviour and risk of falling using both quantitative and qualitative techniques.

The objectives of this study were to collect data on:

- older people's 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 and variation with individual characteristics, such as fall history, and individual capability.
- knowledge of factors affecting fall safety and extent to which knowledge influences behaviour.
- constraints and obstacles to modifying behaviour and the 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 centres, shops and meeting venues for recruitment purposes.
4.2.1 Procedure

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 (using standard, manual anthropometers), along with other measurements including grip strength (using a dynamometer), ability to get off a stool without using hands, spectacle use and measures of visual acuity (using a Snellen chart at 2 meters distance in well lit conditions) and depth perception (using a Frisby plate). See Table 4.1 for the interview schedule. Full details of methods and questionnaires which were developed using the findings of Chapter 3 are provided in Appendix B.

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. At the end of each session, interviewees were provided with copies of the leaflets from the DTI's ASTBH campaign and any comments on these were noted. Each interview lasted approximately two hours, with all interviews conducted by the same researcher. All interviewees provided informed consent.
4.2.2 Analysis

Statistical analysis used Chi^2 tests for cross-tabulation calculations with Pearson correlation coefficients for assessing interval and ordinal data associations. Qualitative interpretation of key themes and messages was also used in conjunction with quantitative evaluation.
<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Content</th>
<th>Basis for inclusion</th>
<th>Developed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant Information</td>
<td>• gender</td>
<td>basic information, general health and well being</td>
<td>Loughborough University</td>
</tr>
<tr>
<td>structured interview</td>
<td>• date of birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• conditions affecting vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• general medical conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• prescribed and non-prescribed medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behaviour Questionnaire</td>
<td>• how do participants behave in the home that might affect their risk of falling, e.g. home maintenance, hurrying, clutter</td>
<td>information on behaviour; assessment of relationship between knowledge and behaviour</td>
<td>Loughborough University</td>
</tr>
<tr>
<td>semi-structured interview</td>
<td>• perception of risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• other issues including footwear, alcohol consumption, behaviour of pets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifications to safety and behaviour</td>
<td>• changes in fall related behaviour and safety</td>
<td>information on behaviour and safety changes, assessment of relationship between knowledge and behaviour</td>
<td>Loughborough University</td>
</tr>
<tr>
<td></td>
<td>• use of aids and equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• receipt of previous fall safety advice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falls in the home</td>
<td>• history of falls since age 65</td>
<td>examination of differences in behaviour and attitudes between 'fallers' and 'non-fallers'</td>
<td>Loughborough University</td>
</tr>
<tr>
<td>semi-structured interview</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to carry out daily activities</td>
<td>• participants' ability to carry out a range of daily activities</td>
<td>measure of self-assessed functional ability</td>
<td>Modified from Barthel Index</td>
</tr>
<tr>
<td>structured interview</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical and physiological measurements</td>
<td>• height, weight, size of feet</td>
<td>basic information on participants and their functional ability</td>
<td>Loughborough University</td>
</tr>
<tr>
<td></td>
<td>• functional ability ('grip strength', 'rise from stool')</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• vision (acuity, stereopsis)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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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

<table>
<thead>
<tr>
<th>Type of Accommodation</th>
<th>House types in sample (%)</th>
<th>House types in UK (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>Semi-detached</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td>Terraced</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Flat</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Other types of properties (e.g. bed sit)</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>


Characteristics of the 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](image1)

![Figure 4.2 MMBI Functional ability score](image2)

*NB the lower the score the lower the physical ability*
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, although there is some considerable variation amongst the cohort, Figure 4.3, as there is in the general UK older population.
Table 4.3 Body mass index (weight [kg]/height [m²])

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>All participants (%)</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt;20)</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Normal (20 – 25.9)</td>
<td>43</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>High (26 – 29.9)</td>
<td>39</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Obese (=&gt;30)</td>
<td>14</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th>Male (N)</th>
<th>Female (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>273</td>
<td>157</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>83</td>
<td>62</td>
</tr>
<tr>
<td>Minimum</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>400</td>
<td>375</td>
</tr>
</tbody>
</table>

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 score 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)
p<0.001, negative relationship

✓ p<0.001, positive relationship

✗ No relationship

<table>
<thead>
<tr>
<th>Increasing MMBI score</th>
<th>Increasing grip strength score</th>
<th>Increasing ability to rise from stool</th>
<th>Increasing ability to balance on 1 leg</th>
<th>Increasing age</th>
<th>Increasing number of previous falls</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
</tbody>
</table>

Figure 4.6 Physical Assessment Matrix

**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, favouring 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. It was reported by 17% of the sample that loft and attic areas tended to be avoided for the same reasons.

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

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.
As might be anticipated, the results show that with increased age and frailty, an older person in this cohort is less likely to carry items around the home.

Table 4.5 Factors associated with carrying

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
</tr>
<tr>
<td>Other occupant</td>
<td>none</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

**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, Figure 4.9. There were no associations between age or any of the indicators of functional ability and pet keeping.

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

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

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>none</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

**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

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>none</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>none</td>
</tr>
</tbody>
</table>
### 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>
<thead>
<tr>
<th>Table 4.8 Factors associated with gardening</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effect</strong></td>
</tr>
<tr>
<td>Increasing age</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
</tr>
<tr>
<td>Rise from stool ability</td>
</tr>
<tr>
<td>Grip strength</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
</tr>
<tr>
<td>Deteriorating health</td>
</tr>
<tr>
<td>Use of walking aid</td>
</tr>
<tr>
<td>‘Fallers’</td>
</tr>
<tr>
<td>Other occupants</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

### 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

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>(male) association</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>none</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

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 4.10).
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, 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'

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>(male) association</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>negative correlation</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

Table 4.11 Reasons for discontinuing DIY activities (multiple responses)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns over safety</td>
<td>50%</td>
</tr>
<tr>
<td>e.g. dizziness, reduced mobility, loss of energy</td>
<td></td>
</tr>
<tr>
<td>Loss of confidence</td>
<td>25%</td>
</tr>
<tr>
<td>Takes too long</td>
<td>10%</td>
</tr>
<tr>
<td>Partner deceased</td>
<td>3%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>negative correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>positive correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>positive correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Grip strength</td>
<td>positive correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>positive correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>negative correlation</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>negative correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Other occupants</td>
<td>negative correlation</td>
<td>p&lt;0.05</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

**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 4.11 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 4.11). However, the majority (80%) of participants admitted to having some amount of clutter in their homes, although many had reasons, as described in Figures 4.12 and the quotes below.

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

"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..."
The main reasons given for objects to be left on the floor are described in Table 4.13.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items are on the floor but they are left out of the way</td>
<td>27%</td>
</tr>
<tr>
<td>Just shoes / bags</td>
<td>24%</td>
</tr>
<tr>
<td>Only newspapers / magazines</td>
<td>15%</td>
</tr>
<tr>
<td>Forgetfulness / laziness</td>
<td>12%</td>
</tr>
<tr>
<td>Small rugs</td>
<td>12%</td>
</tr>
<tr>
<td>Pets &amp; pet items</td>
<td>3%</td>
</tr>
</tbody>
</table>

There was no association between age or any of the indicators of functional ability or 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. Reasons for not having clutter in the home were varied (Table 4.15), although over half of respondents stated that it was because of the increased risk of falling.
Table 4.14 Factors associated with 'clutter'

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>none</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>none</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>none</td>
</tr>
<tr>
<td>Grip strength</td>
<td>none</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>none</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
</tr>
<tr>
<td>Use walking aid</td>
<td>none</td>
</tr>
<tr>
<td>‘Fallers’</td>
<td>none</td>
</tr>
<tr>
<td>Size of accommodation</td>
<td>none</td>
</tr>
<tr>
<td>Pets</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>negative correlation</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

Table 4.15 Reasons for not having 'clutter'

<table>
<thead>
<tr>
<th>Risk of falling</th>
<th>52%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tidiness</td>
<td>26%</td>
</tr>
<tr>
<td>Can’t bend down – can’t get to objects</td>
<td>9%</td>
</tr>
<tr>
<td>Vision – will trip over objects</td>
<td>6%</td>
</tr>
<tr>
<td>Mobility – can’t avoid objects easily</td>
<td>2%</td>
</tr>
<tr>
<td>(Other</td>
<td>5%)</td>
</tr>
</tbody>
</table>

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 4.13 and Figure 4.19.
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 4.14. 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 4.15; 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.
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 the quotes below and Table 4.16.

"I don't want to disturb my partner..."

"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."
Table 4.16 Factors associated with use of lighting

<table>
<thead>
<tr>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>positive correlation</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Grip strength</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>negative correlation</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
</tr>
<tr>
<td>Use walking aid</td>
<td>positive correlation</td>
</tr>
<tr>
<td>‘Fallers’</td>
<td>none</td>
</tr>
<tr>
<td>Other occupants</td>
<td>none</td>
</tr>
</tbody>
</table>

*Pearson chi square correlation

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

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>positive correlation</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>Gender</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Increasing MMBI score</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Rise from stool ability</td>
<td>negative correlation</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Grip strength</td>
<td>negative correlation</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>Ability to balance on 1 leg</td>
<td>negative correlation</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Deteriorating health</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Use walking aid</td>
<td>positive correlation</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>'Fallers'</td>
<td>none</td>
<td>ns</td>
</tr>
<tr>
<td>Other occupants</td>
<td>none</td>
<td>ns</td>
</tr>
</tbody>
</table>

* Pearson chi square correlation

Modifications to the environment and behaviour

Table 4.18 presents details of participants who reported having made changes to their behaviour in the home and/or the home environment with regard to fall safety, prior to the interview. The table also illustrates proportions of the sample who reported that they were thinking of making changes in the future.

Table 4.18 Modifications to behaviour and environment

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

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

Toileting aids, including raised toilet seats and handles, had often been provided by local authority agencies, and were generally found to be useful. Occasionally, 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."

Changes that individuals thought were acceptable and reported that they might make in the future are illustrated in Table 4.20.
Table 4.20 Acceptable future behavioural/environmental changes

<table>
<thead>
<tr>
<th>Change</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redesign bathroom, e.g. walk in shower/bath</td>
<td>20%</td>
</tr>
<tr>
<td>(Additional) grab rail on stairs</td>
<td>12%</td>
</tr>
<tr>
<td>Stair lift</td>
<td>9%</td>
</tr>
<tr>
<td>Downstairs toilet</td>
<td>8%</td>
</tr>
<tr>
<td>Simplify garden</td>
<td>4%</td>
</tr>
<tr>
<td>Grab rail at doorway/general</td>
<td>3%</td>
</tr>
<tr>
<td>Put telephone/additional phone lines in upstairs</td>
<td>3%</td>
</tr>
<tr>
<td>Remove clutter</td>
<td>3%</td>
</tr>
<tr>
<td>Move to a bungalow</td>
<td>3%</td>
</tr>
<tr>
<td>Anything that's recommended</td>
<td>3%</td>
</tr>
<tr>
<td>Put light switch outside bedroom door</td>
<td>3%</td>
</tr>
<tr>
<td>Get a gardner</td>
<td>3%</td>
</tr>
</tbody>
</table>

Other ideas for future changes from the cohort included: taking exercise, moving furniture from the bottom of the stairs in case of a fall on the stairs; getting a proper loft ladder; getting a motorised wheelchair (for use both in and out of the house); putting a white strip on internal steps to increase visibility; raising furniture (e.g. chair) for easier usage.

Table 4.21 presents details of participants who reported knowledge of fall issues, and Table 4.22 presents details of participants who reported using particular fall related products or who might consider using them in the future.

Table 4.21 Source of knowledge for fall issues

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know of a faller (other than self)</td>
<td>23%</td>
</tr>
<tr>
<td>Know anyone at risk of falling</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Seen or received any advice on falls</td>
<td>5%</td>
</tr>
</tbody>
</table>

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”.

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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 4.22 Product issues

<table>
<thead>
<tr>
<th>Product</th>
<th>Use</th>
<th>Would use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use fall alarm</td>
<td>18%</td>
<td>90%</td>
</tr>
<tr>
<td>Would use fall alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use hip protectors</td>
<td>0%</td>
<td>41%</td>
</tr>
<tr>
<td>Would use hip protectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use bath hoist</td>
<td>0%</td>
<td>74%</td>
</tr>
<tr>
<td>Would use bath hoist</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 4.23). 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:

"Eye drops affect my vision - blurry, stinging, and ingrown eyelashes..."

Table 4.23 Medication and side effects

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants with 1+ health problems related to fall risk</td>
<td>93%</td>
</tr>
<tr>
<td>Participants taking 1+ prescribed medications daily</td>
<td>79%</td>
</tr>
<tr>
<td>Participants taking 4+ prescribed medications daily</td>
<td>23%</td>
</tr>
<tr>
<td>Participants experiencing fall-related side effects from</td>
<td>13%</td>
</tr>
<tr>
<td>prescribed medication</td>
<td></td>
</tr>
</tbody>
</table>
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 4.24.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye test in last 2 years</td>
<td>90%</td>
</tr>
<tr>
<td>Wear bifocal spectacles</td>
<td>39%</td>
</tr>
<tr>
<td>Wear vanfocal spectacles</td>
<td>22%</td>
</tr>
<tr>
<td>Wear combination of reading and distance spectacles</td>
<td>39%</td>
</tr>
</tbody>
</table>

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:

"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..."

"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..."

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:

"I can't get used to the Varilux - I can't tell where the floor is."
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 4.25.

Table 4.25 Visual problems within sample population (multiple responses)

<table>
<thead>
<tr>
<th>Any condition(s) that affects vision, e.g. cataracts, glaucoma.</th>
<th>36%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract(s)</td>
<td>25%</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>5%</td>
</tr>
<tr>
<td>Macular degeneration</td>
<td>2%</td>
</tr>
<tr>
<td>Colour defects</td>
<td>2%</td>
</tr>
<tr>
<td>Other, e.g. diabetic retinopathy, intis, watery eyes</td>
<td>10%</td>
</tr>
</tbody>
</table>

**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. 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. A small proportion of individuals actually abandoned their prescribed walking aids, in favour of using the furniture as a support. In order to avoid abandonment of assistive devices, manufacturers and designers need to give attention to these issues. 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 4.26.
Further problems were reported using walking aids in the home environment, due to the changes in floor surface and texture. 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...it's good but there's not enough space in the house...my hands are too weak to use sticks and I tend to just hold onto the furniture.”

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.
Footwear and Clothing

The most often worn footwear around the home (inside and out) were shoes and slippers, as described in Table 4.27. 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 4.27 Details of footwear worn for percentage of population

<table>
<thead>
<tr>
<th>Type of footwear worn:</th>
<th>In the house</th>
<th>In the garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoes</td>
<td>26%</td>
<td>59%</td>
</tr>
<tr>
<td>Mule (backless) slippers</td>
<td>13%</td>
<td>10%</td>
</tr>
<tr>
<td>Back-filled slippers</td>
<td>43%</td>
<td>21%</td>
</tr>
<tr>
<td>Socks</td>
<td>3%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Sandals</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Wellington boots</td>
<td>-</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Walking boots</td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td>Bare feet</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

The vast majority of interviewees (97%) thought there was some risk of falling related to footwear being worn:

"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."

A large proportion (71%) of the sample thought that the footwear factor was 'greatly' associated with risk of falling, Figure 4.16.
Footwear design, especially that of 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.

Reasons for choosing footwear are tabulated in Table 4.28. 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. Examples are given in these quotes:

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

“I don’t feel safe in heels...the heels get caught in things...although, I do think more of comfort than safety...”
Table 4 28 Reasons for choosing footwear

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort</td>
<td>27%</td>
</tr>
<tr>
<td>Safety</td>
<td>44%</td>
</tr>
<tr>
<td>Comfort and Safety</td>
<td>29%</td>
</tr>
</tbody>
</table>

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 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. 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”.

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

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. General information about the cohort’s use of alcohol is described in Table 4.29.

Table 4.29 Use of alcohol

<table>
<thead>
<tr>
<th>Drink alcohol</th>
<th>71%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean number of units per week</td>
<td>6</td>
</tr>
<tr>
<td>Minimum no. of units per week</td>
<td>0</td>
</tr>
<tr>
<td>Maximum no. of units per week</td>
<td>70</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>6.5</td>
</tr>
<tr>
<td>Avoid if on medication</td>
<td>67%</td>
</tr>
</tbody>
</table>

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 4.17 presents details of origin of the advice.

"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"

Figure 4.17 Origin of falls information
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, with 95% of the former and 90% of the latter reporting to have at least 1 health problem related to falling. Specific health problems for the two subgroups of the cohort are described in Figure 4.18. 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.

![Health problems (multiple responses)](image)

Figure 4.18 Health problems (multiple responses)

Of the most recent fall reported per faller, the most common locations for an incident included the garden and the living areas of the home. Figure 4.19 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. Perceived risk was measured with the question: “Where in the home do you feel most at risk of falling?” 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.

![Fall Location and perceived risk](image)

**Figure 4.29 Fall Location and perceived risk**

Figure 4.20 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.).
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 4.21.
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

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

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 that extrinsic factors (44%) or behaviour (35%) played an important role, Figure 4.22. Tables 4.31-4.32 give a further breakdown of the perceived causal factors in falls.

Figure 4.22 Causes of falls
Table 4.31 Extrinsic factors in falling (within all causes of falls)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip over (unfixed) object, e.g. clutter</td>
<td>13%</td>
</tr>
<tr>
<td>Slippery surface (indoors)</td>
<td>10%</td>
</tr>
<tr>
<td>Slippery surface (outdoors)</td>
<td>7%</td>
</tr>
<tr>
<td>Uneven surface</td>
<td>5.5%</td>
</tr>
<tr>
<td>Trip over (fixed) object, e.g. furnishing</td>
<td>4.5%</td>
</tr>
<tr>
<td>Walking aid</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rushing</td>
<td>12%</td>
</tr>
<tr>
<td>Footwear</td>
<td>10%</td>
</tr>
<tr>
<td>Fall from height</td>
<td>5%</td>
</tr>
<tr>
<td>Light level</td>
<td>3%</td>
</tr>
<tr>
<td>Overstretching/bending</td>
<td>2%</td>
</tr>
<tr>
<td>Carrying</td>
<td>1%</td>
</tr>
<tr>
<td>Pets</td>
<td>1%</td>
</tr>
<tr>
<td>Use of spectacles</td>
<td>1%</td>
</tr>
</tbody>
</table>

Products involved in falls

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, and the use of stepladders etc., Table 4.33.

“I changed my net curtains to blinds to stop myself climbing up and taking them down to wash them all the time...”
### Table 4.33 Product factors in falling (within all causes of falls)

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

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.

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.

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 4.23.

![Figure 4.23 Falls among older people](image-url)
Perceptions post fall

After a fall episode, fallers reported feeling fearful and cautious in their behaviour (see Figure 4.24). Occasionally, participants also reported not feeling worried about falling as they take the attitude that 'if it happens it happens' ('Other').

![Figure 4.24 Reported feelings post fall](image)

The majority (79%) of fallers reported changing their behaviour since their last fall episode. Details are given in Table 4.34.

<table>
<thead>
<tr>
<th>Table 4.34 Changes in behaviour after falling (multiple responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take extra care/more attention when doing tasks</td>
</tr>
<tr>
<td>Avoid rushing</td>
</tr>
<tr>
<td>Environmental changes, e.g. lighting, clutter</td>
</tr>
<tr>
<td>Curtailment of tasks, e.g. gardening, housework</td>
</tr>
<tr>
<td>Change in footwear</td>
</tr>
<tr>
<td>Watch where placing feet</td>
</tr>
<tr>
<td>Wear fall alarm</td>
</tr>
</tbody>
</table>
4.4 Discussion

The aim of this interview survey was to use an accident-independent approach to collect detailed information on the interaction between behaviour and risk of falling using both quantitative and qualitative techniques. Each of the objectives have been discussed in turn with respect to the findings, before a summary of the interactions between fall risk factors is offered. Following this, the limitations of the study are presented and the implications for future project research are discussed. Finally, the section concludes and summarises the findings.

4.4.1 The interaction between behaviour and risk of falling

It is apparent that behaviour has a pivotal role to play in the reported fall risk (perceived and actual) amongst the cohort and has a dependant relationship to other fall risk factors. The behavioural categories (after Hill et al 2000) have been re-examined with respect to the responses in this study. Hill et al (2000) investigated stair falls and behavioural risk factors and developed a model of the breakdown of types of behaviour, Figure 4.25. As discussed in chapter 2, this model only includes behaviour and does not show the other interacting risk factors predisposing individuals to increased fall risk, for example, a person's abilities and their social situation. The results from this study imply many additional interacting issues in behavioural fall risk.
Each type of behaviour has been taken in turn and the relationship of fresh interactions implicated from the findings have been added in, Figures 4.26-28. A summary tabulating the key behavioural factors attributed to fall risk and examples of why they are perceived to instigate problems is recorded, Table 4.35.

Finally, towards the end of this chapter section, after the discussion of Figures 4.26-28 and Table 3.5, a single diagram is presented summarising the interaction between all three types of behaviour and the ensuing interacting risk factors, Figure 4.29.
Figure 4.26 Behaviour in the home environment

Key

Category of behaviour

Implicated issues for fall risk

Type of risk factor:
- psychological
- situational/peripheral
- physical
- mental
- environmental
Figure 4.27 Behaviour affecting the home environment

Key

- Category of behaviour
- Implicated issues for fall risk

Type of risk factor:
- Psychological
- Situational/peripheral
- Physical
- Mental
- Environmental
Figure 4.28 Behaviour affecting individual capability

Key

- Category of behaviour
- Implicated issues for fall risk

Type of risk factor:
- psychological
- situational/peripheral
- physical
- mental
- environmental

Past experiences

Confidence

Mental capability, e.g., concentration

Physical capability

Socioeconomics

Behaviour affecting capability

Fall event

Poor allowance made for state of physical abilities, e.g., continued risky actions such as rushing, carrying, lifting
Misuse of (inappropriate) spectacles
Misuse of (inappropriate) walking aids
Poor choice of clothing and footwear
Poor design/maintenance of home environment
<table>
<thead>
<tr>
<th>Behaviour attributed to fall risk by older people</th>
<th>Nature of risk</th>
</tr>
</thead>
</table>
| Carrying items around the home                   | • Obscured visual field  
|                                                  | • Impaired balance / stability |
| Keeping of pets in the home                      | • Increased trip hazards present – pet and pet associated items  
|                                                  | • Pets serving to distract owner  
|                                                  | • Owners hurrying to attend to them |
| Housework / cleaning                             | • Increased trip hazards present  
|                                                  | • Impaired balance / stability during reaching / bending / lifting tasks |
| Hurrying around the home                         | • Increased probability of slipping or tripping due to lack of concentration and high speed  
|                                                  | • Increased risk of impaired balance / stability |
| Gardening activities                             | • Increased slip and trip hazards present  
|                                                  | • Increased risk of impaired balance / stability |
| Home maintenance                                 | • Falling from height (e.g. from a stepladder or when standing on a chair)  
|                                                  | • Increased risk of impaired balance / stability during reaching / bending tasks  
|                                                  | • Use and provision of lighting  
|                                                  | • Design layout of home |
| Leaving items on the floor (clutter)             | • Slip and trip hazards present |
| Use of medications                               | • Side effects, including dizziness and drowsiness, impaired vision, effects on balance |
| Use of spectacles and unattended vision          | • Impaired vision implicating increased risk of trip or slip |
| Use of walking aids                              | • Acting as a trip hazard  
|                                                  | • Handling bulky item |
| Use of (certain) footwear                        | • Increased risk of slipping (when wearing footwear with slippery soles)  
|                                                  | • Increased risk of tripping (when wearing insecure footwear)  
|                                                  | • Impaired balance / stability (when wearing heeled footwear) |
| Use of (certain) clothing                        | • Trip hazards present (when wearing loose bottomed trousers or long skirts) |
4.4.2 Older people’s interaction with their home environment

The types of behaviour affecting direct use of the home environment and fall risk are listed in Figure 4.26. The original design and features of the environment (e.g. steps, slopes, floor surfaces) have an impact on how an individual interacts with it. The socioeconomic background of the individual may have an effect on the design and features of the environment (e.g. this determines whether a person can afford to make changes to the home) and on the mindset of the individual (e.g. “I can’t afford to pay someone to do that for me, I’ll carry on even though I’m not confident doing it”). Advice and education from other people can affect mindset, perception of risk and whether an individual recognises their limitations. Personality and/or mindset and perception of risk also have a role to play in the extent of an individual’s recognition of their limitations. Physical capability (of which mental capability is a strongly associated risk factor) also has an effect on the individual’s behaviour in the home, as this determines whether an individual can physically manage certain behaviours, e.g. cleaning, carrying out DIY activities.

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 findings suggest, as would be expected, that older people move around their homes as and when necessary, but that movement is reduced by declining abilities. Use of necessary conveniences, such as the lavatory, may require increased actions. Other activities also lead to increased movement, for example, cleaning or preparing to go out. Cleaning around the home appears to present particular problems, due to a combination of difficult access and the need to use awkward equipment. 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. Dependant on whether a person lives with someone else or on their own can affect behaviour and movement around the home.

Instances of unsafe behaviour in the home were identified among those interviewed. Frequently, the individual's outlook seemed to be that while an activity might be hazardous, the manner in which they undertook it reduced their risk to an acceptable level. For example, leaving objects, e.g. shoes, on the floor was considered reasonable. There also appeared to be little appreciation that an individual's actions might have implications for the safety of others in the home. For example, items placed on the floor might form a trip hazard for another person who does not know the objects are there.

Older people may continue with some actions, regardless of facing problems and experiencing concern about safety, e.g. climbing up on things to clean windows. It could be perceived from the participants in the study that pride and a desire to maintain standards and routine were encouraging them to maintain this behaviour.
4.4.3 Behaviour affecting the home environment and implications for fall risk

It can be implicated from the findings that within the type of behaviour that affects the home environment, there are two classes of behaviour; that of an individual themselves and that of any co-inhabitants or visitors, e.g. grandchildren, Figure 4.27. The combined causal fall risk behaviours have been identified as use of lighting and maintenance of the home environment (primarily indicated as ‘clutter’). A further risk behaviour of choice of environmental design and features has been identified for the ‘individual’. An individual’s behaviour is affected by the extent of their recognition and acceptance of the consequences of a fall and fall risk, as well as their physical capability. From comments in the interviews, the state of an individual’s physical capability appears to affect recognition and acceptance of fall risk (“I’m not old yet, I can cope” vs “I can’t walk too well now, I have to be careful about falling”). Physical capability also has a role to play in the individual’s level of expectation of fall risk; from comments it can be perceived that generally, the frailer the individual, the higher the expectation of falling. From this qualitative evidence it can be suggested that an individual’s expectation of falling has an impact upon an individual’s recognition and acceptance of fall risk.

With regard to floor covering, there was recognition that loose carpets and rugs, raised thresholds, and decrepit surfaces may have implications for safety. Only a minority of the participants were aware of difficulties that surface colour may make in judging distances or locating step edges. None of the interviewees were aware of the consequences that surface pattern may have on these issues (Cohn and Lasley 1985). Therefore, it appears that these issues are unlikely to be considered by older people when selecting carpets and coverings.

Interestingly, the participants spent a large amount of time discussing environmental issues in comparison to behavioural or individual factors. For example, the floor covering and surface were talked about at length.
Reasoning behind this could be that people find it more difficult to envisage how their behaviour may impinge on risk of falling, when for the majority of the time they move around their homes without event.

4.4.4 Behaviour affecting capability and variation with individual characteristics

There are many different behaviours that can affect an individual's physical capability, as described in Figure 4.28. There is anecdotal evidence that one's physical capabilities impact on extent, nature and choice of behaviour. This evidence was supported by some of the quantitative findings: 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 management 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.

It was stated that the condition of physical capability influences the amount of mental alertness that is required to ambulate safely. For example, a frail individual may need to concentrate greatly on each physical movement to ensure that a fall does not occur. However, it is rare that at such an age, mental and physical capabilities will be optimal for all individuals; hence a person needs to weigh up the probability of falling against mental and physical capabilities and adapt their behaviour accordingly. The decline of functional ability with age is well documented (Skelton et al 1994; Luukinen et al 1995). Most individuals appeared to appreciate what to expect in terms of changing functional ability with age, although many did not perceive themselves as "being old yet", and discussed the difficulty with aging relatives not accepting that they were in decline. It is possible, however, that the often gradual
deterioration in physical and mental abilities lead some to not always fully understand their limitations. The aim here should be to help older people to be realistic, while avoiding being unnecessarily pessimistic. Individual capabilities and confidence affect how older people move around their homes, and the activities they undertake, with some exhibiting increased caution. Further investigation is needed to assess the merits of different approaches in terms of safety and efficiency, how they might suit different people, and whether it might be possible or desirable to develop equipment or home features to assist.

It was suggested by participants that past experience of falls can impact on behaviour as well as upon the confidence of a person. Confidence in turn can affect the extent, nature and choice of behaviour and upon the mental capabilities that an individual will draw upon when moving about their home. 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.

4.4.5 Knowledge of factors affecting fall safety and extent to which knowledge influences behaviour

Perception of risk
The behaviours which older people in the survey thought placed them at most 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 were perceived as increasing risk, respondents reported that they did still hurry on occasions and also frequently left 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."

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 this is perhaps 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 was 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 were, for the participants in this study, perceived as one of the most dangerous areas of the home, although the number of falls that actually occurred in this location was 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 seventy 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.

**Attribution of cause**

There is consistency in the 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."
4.4.6 Constraints and obstacles to modifying behaviour and environment

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 slippy 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 of 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..."

Use of 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 are 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.
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.

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.”

These features are to a large extent, very difficult to change and are therefore, obstacles to making the environment more user friendly and 'fall safe'.

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. slippy surfaces. Simple modifications can easily cause problems if they are not thought through properly, and this is often the case.

4.4.7 Summarising the interaction between fall risk factors

The research has assessed the extent of older people’s knowledge of factors affecting risk of falling around the home and examined how behaviour varies with individual characteristics. Furthermore, the methods have collected 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 some of the barriers to change.

It is suggested from the diagrams (Figures 4.26-4.28) that inferences drawn in the behaviour has an impact on the established fall risk factors and on the newly implied risk factors discussed in the interviews, and vice versa.
Furthermore, it is apparent that ‘behaviour’ itself is a key risk factor for falling and has an impact on all the other categories of risk factors.

There is overlap and some repetition between the three different types of behaviour and the other varying risk factors. This suggests that there are other interactions between the three different types of behaviour, not only those that have been broached in these interviews. It does appear that the categories of risk factors identified from the focus groups (chapter 3) which have an effect on fall risk can be reinforced with the findings from the interview survey. The risk factors can be divided into 3 overlying categories (intrinsic, extrinsic and behavioural) with 5 key areas: psychological, physical, mental, environmental and situational/peripheral.

There are many complex interactions occurring, which have been summarised in Figure 4.29. The individual is the most important element of the model, and should also be the most important element in the design process. Products, equipment and environments should be designed with the individual/person in mind to be suitable for the needs and desires of the user. The products, equipment and environments are required to be of a certain level of condition/repair, of a well thought out (inclusive) design, and easy/intuitive to use/navigate. Products, equipment and environments are often ignored, although many of the factors concerning these could be modified relatively simply and cost-efficiently. Individual factors have been concentrated on in the literature and research to date. It is clear that many of the ‘individual’ factors are difficult to modify or are non-modifiable. Peripheral influences are far less controllable as they are multifaceted and multi-dependant.

Therefore, an individual may choose to move about their home in a way that increases fall risk. Additionally, they may choose to design and keep their home in a certain way, or impose an option on themselves that affects their personal limitations. These choices may be due to a lack of awareness of their personal limitations and failure to adjust their behaviour accordingly. However, it appears that these behaviours are all dependent on physical and psychological health, fall history, socio-economic status, pressure and support.
from family and health professionals, and product and equipment interaction. The environment in which an older person resides and the equipment and products that are used should be designed appropriately for the individuals' capabilities in order to keep the demands of the environment and equipment as low as possible. An individual's behaviour affects an individual's psychological perspective, physical and mental capabilities, and environmental and peripheral influences, each of which in turn have an impact on behaviour and on each other.
Figure 4.29 Influences affecting older peoples’ risk of falling in the home
4.4.8 Limitations of the study

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 frail persons participating in the study. Therefore, the information obtained from the sample may have been more representative of the behaviours and activities of a ‘younger’ older population. This may mean that information on difficulties older people endure with tasks and specific aspects of the environment may have been missing. Conversely, a large range of information will have been gathered about the extent to which a range of older people undertake aspects of daily living and the risks that they are likely to take with respect to falling in the home.

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 the nature of the topic played a role. Therefore, information pertaining to the living environments and activities of individuals from lower socioeconomic groups may be lacking. However, it is interesting to note that even with a high selection of ‘best case’ scenarios (i.e. individuals with social facility and prosperity) fall related design issues and lack of awareness of risk are still common.

Approach
The methodology was derived from the findings of focus groups (chapter 3) a candid, unbiased approach, which was useful in the development of the interview survey methodology. The resultant questionnaires and tests were designed to capture a wide spectrum of information, and the nature of the
interviews meant that the information collected was very detailed, a strength of this work.

It is felt that the variety of the questioning and the nature of the information that was given to the interviewees (e.g. commonality of falls among older people, examples of everyday activities older people do which put them at risk of falling) may have allayed any feelings of embarrassment. It is hoped that this informal yet informative approach would have made the participants more able to be honest about their own activities and experiences. It is possible though that these examples of falls and related behaviours given to the interviewees may have biased their responses. It is, however, very difficult to prompt individuals to talk about their own experiences without sometimes giving them examples.

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). Despite this it is highly possible that retrospective data collection may have resulted in some information being missed.

A good rapport was built up between the researcher and the interviewees, and it is anticipated that these relationships helped with the data collection for this study and with the recruitment for later phases of the research project. It is possible, however, that participant responses may have been focussed towards giving the researcher a more positive view of fall risk perception and general behaviour.

4.4.9 Implications for future project research
It is suggested from the findings of this 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 the use of medication and alcohol, ability to see correctly (eye tests and correct use of spectacles), and exercise (building and maintaining physical fitness). More detail is required on falls and the contribution of behaviour, which could be addressed in a prospective cohort study. Such a study could also validate the efficacy of these findings.

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. The research has also highlighted some reasons why older people change their behaviour (e.g. physiological deterioration) or choose not to comply with the suggested use of aids and equipment (e.g. limited space, cost, aesthetics).

From the results of the home interviews, it appears that there are a number of approaches that could be of benefit in improving the safety of older people in the home. It seems there is a significant role for safety education. While participants were generally able to appreciate and understand hazards, these generally needed to be brought to their attention first. Responses from the group suggest that older people are willing to listen to and accept advice, eager to learn how to minimize the likelihood of injuring themselves. A strong desire to maintain independence and autonomy work in favour of this. A prerequisite, however, is awareness that there is a problem in the first place. Interestingly, it was apparent that some individuals from the sample found the interview session itself a useful method of understanding and becoming more aware of the issues:

"This session's really made me think."

Routes for education are many and approaches need to be tailored to different circumstances. It may be appropriate to begin this process at the time people retire, when most are still active enough to be able to make...
changes to the physical environment for themselves, also avoiding problems there may be communicating with some people as they age (Wnght and Whaley 1994).

As might be expected, personal experience, involving either the individual or an associate, appears to have the strongest effect on perception of safety. For example, for a female participant whose friend had fallen during a DIY activity, this was the determining factor in her decision to forbid her husband from undertaking such tasks any longer. From the evidence in this chapter, it can be suggested that psychological perspective is a very strong component in fall risk and in the reasoning behind behaviour. If this could be investigated and psychological state and/or mindset changed, perhaps safer behaviours and a consequent reduction in falls could result. The use of health psychology models in improving understanding could be examined.

Although falls among older people are complex events, involving many factors, there is evidence that concerted intervention strategies can reduce their number and severity. Encouragement comes from recent medical studies, which have shown such programmes to be beneficial (Close et al 1999; Steinberg et al 2000). However, to effectively address the problem, it is essential that difference agencies concerned with fall prevention recognize and take the issue as a priority and then collaborate effectively to address the problem.

4.5 Summary and conclusions

This study has used an interview 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. 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.
Chapter 5

AN INVESTIGATION OF PROSPECTIVE FALL EPISODES

5.1 Introduction

5.1.1 Outline of research presented in chapter

Previous studies (chapters 3 and 4) were multifaceted using a range of participants from a variety of types of housing and backgrounds. They gathered information about older people's interaction with their home environment that may affect risk of falling and retrospective information about previous fall episodes. This investigation complements the previous two research studies and is the third component of the triangulation approach. Similar issues are addressed but a prospective methodology is used as the study attempts to capture accident-centred data (Bentley and Haslam 1998) on fall causation and to validate and add to the previous findings.

This chapter describes how a group of older people, after being interviewed in their homes about fall safety, participated in a fall notification scheme over the course of the subsequent year*. Detailed information on the causes of falls has been analysed. The relationship between physical abilities, behaviour, and design of the home environment, have been investigated. The chapter discusses the falls in terms of type, severity and cause of fall, and how behaviour has changed as a result of these incidences and since the initial interview.

5.1.2 Aim

The aim was to follow up a cohort of older people over the course of the year following their participation in the Home Interview Survey (chapter 4) so as to examine the frequency and causal issues in further falls. The objectives were to:

* The main findings of this work were presented at the Annual Conference of the Ergonomics Society, Edinburgh, April 2003 (Brace et al 2003a)
• examine fall causation in particular with regard to behaviour, design of the home environment and physical abilities
• examine any changes in behaviour resulting from falls
• obtain qualitative information from older people about the effects of an educational home visit (interview – chapter 4) on perception of fall risk and behaviour

5.2 Methods
5.2.1 Procedure
After partaking in the home interview survey, each individual (or couple) was written to and thanked for their contribution to the study (Appendix C). In the same letter, their continued support was invited by participation in a Fall Notification Scheme for a period of a further year from the date of each individual’s home interview. The letter detailed the requirements for involvement, which were simply that the researcher should be alerted if the individual were to have a fall in their home or the home of a friend of relative. Individuals were asked to complete and return a Freepost reply slip attached to the letter to indicate whether or not they consented to take part in this further study.

Of the original interviewed participants, 156 agreed to participate in the follow up study (86% response rate). Consenting participants were then sent a second letter thanking them, in a pack which contained further details about the study, Freepost envelopes and fall notification postcards (Appendix C).

The starting date for each individual participating in this study was staggered over a period of 10 months, which was the duration of the interviewing period (chapter 4). Due to approximately equal numbers of participants being interviewed throughout this duration, total participant numbers for each month of the fall notification scheme were generally constant. This was necessary so that data was not biased for fall frequencies. Therefore, overall participation for this follow up study was distributed fairly evenly over the course of a total of 22 months.
Participants were strongly encouraged to alert the researcher as soon as possible after a fall within the home (or within the home of a friend or relative), in order to keep validity and memory recall as high as possible. Individuals were asked to do this by completion of a fall notification postcard or by telephoning the free phone number. A very positive emphasis was given to participants that the researcher was interested in all falls regardless of whether or not an injury was sustained.

When alerted, the researcher used a telephone interview to elicit all possible information about the fall/s (Appendix C). The interview proforma was designed to cover all possible aspects of fall causation that had been identified so far from the previous studies, including issues identified in the literature. Fallers were additionally asked to describe the primary causal factor involved in each fall. These were then categorised into a behavioural, intrinsic or extrinsic risk factor. Information was also sought on behavioural change and any additional useful case study information. The telephone interview lasted approximately 15 minutes per reported fall, depending on the nature and extent of information collected.

At six months, personalised reminder letters (including further notification postcards, freepost envelopes and reminder details of the study) were distributed to all participants. This point in time was chosen because it was felt to be sufficiently long enough in duration since the interview that repeating the message for memory purposes may be useful. However, it was not so close to the time of the interview that individuals may have felt beleaguered and 'under pressure' to have fallen, a very negative sensation that was not wished to be conveyed. Furthermore, it was strongly felt that the research should not make participants more anxious about falling.

At twelve months a final semi-structured telephone interview was conducted (Appendix C) with each individual to gather any supplementary or missing fall data and to further investigate changes in fall related behaviour and perceptions of fall risk since the original home interview. The contributors were also thanked for their continued support and participation in the study.
Each final interview lasted approximately 15 minutes, again, depending on the nature and extent of information collected.

The accident and behaviour data were coded when entered into Excel and analysed using SPSS for Windows.

5.3 Results

5.3.1 Information about the sample population

The final sample consisted of 150 participants, after 2 deaths, and 4 unobtainable. These individuals consisted of 40 male (27%) and 110 females (73%). The mean age of participants at the end of the year's notification period was 76 years (SD 6.7, range 66-91). Just under half (41%, n=28) of the reported fall incidents were from male participants.

5.3.2 Information about fall episodes

Frequency of falls

At the end of the year, 69 falls were reported from a total of 44 individuals, within a final sample of 150 participants (after 2 deaths, 4 unobtainable), a fall rate of 29%. The range of falls reported per person was 1 – 12 (mean 1.57, SD 1.78). The majority (88%) of falls reported were recorded within 2 months of the incident occurring.

Types of falls

Types of falls were varied but not dissimilar from Home Accident Surveillance System (HASS) data, Table 5.1. The most common mechanisms were a trip or stumble, or a slip, which resulted in almost two-thirds of falls in this study.
Table 5.1 Fall type

<table>
<thead>
<tr>
<th>Fall Type</th>
<th>% falls in this study</th>
<th>% falls in older population *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slip</td>
<td>24</td>
<td>63</td>
</tr>
<tr>
<td>Trip/stumble</td>
<td>39</td>
<td>48</td>
</tr>
<tr>
<td>Fall on/from stairs/steps</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Fall on/from ladder/stepladder</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Fall from building/structure</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Other fall from one level to another</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Slip/trip no fall</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Body part gave way</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Unspecified</td>
<td>3</td>
<td>27</td>
</tr>
</tbody>
</table>

*1999 HASS data, DTI 2001

Location of falls

The vast proportion of falls occurred within a person’s own home (86%). The remainder occurred in the homes of friends or family (14%). As found in chapter 4, and in line with HASS data, the majority of reported falls occurred in the garden (41%). The second most common location for falling was the living area of the home (25%), Figure 5.1. There was no significant relationship between location of fall and severity or type of injury.
Causes of Falls

Table 5.2 gives a breakdown of the perceived causal factors reported by participants in all fall incidents amongst the sample. It is apparent that hurrying and keeping clutter on the floor were perceived as major contributors to falls by this sample population. Figure 5.2 gives further information on the multiple behavioural factors involved in reported falls, which again emphasises hurrying as a strong contributor in falls. The environment played a role in 67% of all reported falls. The most common extrinsic factors were trip hazards and uneven surfaces. Intrinsic factors were involved in 46% (n=32) of falls, and 19 falls (28%) were reported to be due to solely intrinsic factors, e.g. poor balance, dizziness. Behavioural aspects were a factor in 54% of all falls. The most frequently reported factors involved in falls were balance, rushing and a combination of behaviours (clutter, use of inadequate footwear, pet keeping).

Figure 5.1 Fall location

*mean of HASS data 2000-2002, RoSPA 2004
<table>
<thead>
<tr>
<th>Behavioural Factor</th>
<th>Intrinsic Factor</th>
<th>Extrinsic Factor</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/a</td>
<td>trip over unfixed object</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>slippery surface indoors</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>slippery surface outdoors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trip over fixed object</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>uneven surface</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>walking aid</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>32</td>
</tr>
<tr>
<td>N/a</td>
<td></td>
<td></td>
<td>12.5%</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
<td></td>
<td>65.6%</td>
</tr>
<tr>
<td></td>
<td>Body part give way</td>
<td></td>
<td>32.1%</td>
</tr>
<tr>
<td></td>
<td>Poor vision</td>
<td></td>
<td>3.1%</td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
<td></td>
<td>6.3%</td>
</tr>
<tr>
<td></td>
<td>Medication effect</td>
<td></td>
<td>6.3%</td>
</tr>
<tr>
<td></td>
<td>Combinatory intrinsic</td>
<td></td>
<td>3.1%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>N/a</td>
<td></td>
<td></td>
<td>30.8%</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
<td></td>
<td>19.1%</td>
</tr>
<tr>
<td></td>
<td>Body part give way</td>
<td></td>
<td>7.7%</td>
</tr>
<tr>
<td></td>
<td>Medication effect</td>
<td></td>
<td>7.7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>N/a</td>
<td></td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Body part give way</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Medication effect</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>N/a</td>
<td></td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Body part give way</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Medication effect</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>N/a</td>
<td></td>
<td></td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td>Body part give way</td>
<td></td>
<td>1.4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

continued...
### Table: Behavioural Factors and Extrinsic Factors

<table>
<thead>
<tr>
<th>Behavioural Factor</th>
<th>Intrinsic Factor</th>
<th>Extrinsic Factor</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/a</td>
<td>trip over unfixed object</td>
<td>slipping surface outdoors</td>
</tr>
<tr>
<td>Carry - affecting vision*</td>
<td>N/a</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>100.0%</td>
<td>3</td>
</tr>
<tr>
<td>Over-reaching/ stretching</td>
<td>N/a</td>
<td>3</td>
<td>25.0%</td>
</tr>
<tr>
<td>Poor vision</td>
<td>1</td>
<td>100.0%</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>100.0%</td>
<td>4</td>
</tr>
<tr>
<td>Use of lighting</td>
<td>Balance</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>100.0%</td>
<td>1</td>
</tr>
<tr>
<td>Use of clothing</td>
<td>Balance</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>100.0%</td>
<td>1</td>
</tr>
<tr>
<td>Combination of behaviours**</td>
<td>N/a</td>
<td>1</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>10.0%</td>
<td>2</td>
</tr>
</tbody>
</table>

TOTAL | 23 | 10 | 7 | 10 | 9 | 5 | 5 | 69 | 100.0% |

* this behavioural factor has also resulted in fall(s) when combined with other behaviour.
(See Figure 5.2.)

** total number of falls caused by a ‘combination of behavioural factors’.

190
Table 5.3 gives information about the main (primary) causal factor that was reported by participants to have initiated each fall. It is interesting to compare these prospective 'actual' figures with those retrospectively reported 'perceived' primary causes of falls described during the home interview survey (chapter 4). The 'perceived' and 'actual reports' for behavioural factors as a primary cause of falls are very similar, although there are discrepancies for intrinsic and extrinsic causal factors.
Table 5.3 Primary reported cause of fall

<table>
<thead>
<tr>
<th>Primary causal factor</th>
<th>Number of falls</th>
<th>% of falls</th>
<th>Perceived primary cause of falls (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>23</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>17</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>29</td>
<td>42</td>
<td>18</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

* data from Home Interview Survey, chapter 4

It must be emphasised, as shown in Table 5.2, that the majority (72%) of falls were perceived as being multifactorial in their causation, as also demonstrated by the following quote:

“I was putting bread out for the birds in the garden and I tripped on a raised paving slab on the patio. I was hurrying as it was cold out, and I just flew forward onto my hands. It was first thing in the morning after breakfast and I was feeling a bit dopey as I was taking some new medication that was making me feel a bit peculiar. I think that certainly had something to do with it. I’m going to ask the doctor about these pills because I’m not sure about them.”

In just under a third of cases (28%), individuals perceived that only one factor had played a role in the incident:

“I was at a friend’s house and wasn’t used to the step down to the kitchen. Didn’t really notice it and went flying. I broke my wrist and had concussion.”

The latter reported fall is an example of how an extrinsic risk factor (the kitchen step) is perceived as being the only fall risk factor. Earlier studies in this thesis (chapters 3, 4) demonstrate that intrinsic (psychological) issues such as recognition and acceptance of fall risk, expectation, risk perception, and confidence may all also have played a role in this fall as the participant
was "at a friend's house" and "wasn't used to the step" and so "didn't really notice it".

Temporal effects
As may be expected, most falls occurred during the daytime (specifically between the hours of 6am and 6pm), as the majority of activities and movements are undertaken during these hours, Figure 5.3. This pattern may also be reflective of the relatively active and healthy nature of the sample, who report undertaking many daytime activities that could affect risk of falling, e.g. using stepladders and rushing. Therefore, it is not a dissimilar finding from that of the home interview survey reported in chapter 4.

Figure 5.3 Time of day when falls occur

No significant differences in numbers of reported falls were found between seasons. There were increased numbers of falls in the winter months (November-February), as may be expected as many of these were due to extrinsic risk in the form of challenging weather conditions (e.g. ice). The period of data collection (February 2001- November 2002) had a typical annual
weather pattern, with no excessive or unusual amounts of bad weather reported. However, when looking at these numbers they tend to balance out overall in the warmer months with an increased quantity of falls being sustained due to increased level of activity such as gardening, Figures 5.4 and 5.5.

Figure 5.4 Time of year when falls occur
There are significant differences (p<0.01) between the seasons for the primary reported casual factors of falls. There are more reports of behaviour being a primary factor in the winter months than in the spring, summer or autumn periods. Furthermore, intrinsic risk factors are less commonly reported in the winter season compared to the other periods of the year, Figure 5.6.
Injuries resulting from falls

A large proportion (84%) of fall episodes resulted in some degree of injury, with varying levels of severity (from bruising to fractures). However, only 14% of falls resulted in hospital treatment and 11% in visits to the GP. The remaining 75% of fall-incurred injuries were self treated by the individuals concerned. The type and severity of injury reported in this study compared to previously published findings are described in Table 5.4. It appears that the previous findings are proportionately lower than those from this study.
### Table 5.4 Frequencies of injury type/severity

<table>
<thead>
<tr>
<th>Type/severity of injury</th>
<th>Reported findings (%)</th>
<th>Findings from this study (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture</td>
<td>2 - 6</td>
<td>11</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>0.2 - 1.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Serious injury (e.g.</td>
<td>10 - 15</td>
<td>21</td>
</tr>
<tr>
<td>laceration, concussion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some injury</td>
<td>22 - 60</td>
<td>84</td>
</tr>
</tbody>
</table>

*Gibson et al 1987, Speechley and Tinetti 1991

The most common injuries reported included general bruising (36%), bruised head and/or face (10%), and bruised hip area (9%), Figure 5.7. The category of general bruising (which included hand injuries), most frequently reported in this study, is also the most common type of injury sustained as reported in previous studies (Lord et al 2001).

![Figure 5.7 Types of fall-incurred injuries](image)
There were no significant differences between primary reported cause of fall and; type of injury, recovery time, location of fall, type of fall, or complexity of treatment required. Nor were there were any significant differences between severity or location of injury, location of fall event and number of previous falls. It may have been expected that certain fall locations may have resulted in more severe injury due to their design and features (Lord et al 2001).

Recovery time

Recovery time varied according to severity of injury. Just under half of fall episodes resulted in an immediate recovery (22%) or a complete recovery within a number of days (23%). However, over half of reported incidents required further time for a complete recovery which involved several weeks (39%) or months (14%). One person died as a result of his fall.

As may be expected, there were positive linear relationships between severity of injury and recovery time (p<0.001, r = 0.601), severity of injury and complexity of treatment required (p<0.001, r = 0.674), and recovery time and complexity of treatment required (p<0.001, r = 0.499).

5.3.3 Relationship between falls and behaviour

There were no significant differences between fallers and non-fallers for reported changes in behaviour; 61% of fallers and 63% of non-fallers reported taking more care in their behaviour since the initial home interview. Similar numbers of fallers and non-fallers reported a fear of falling at the final interview (41% and 42% respectively).

Furthermore, there were no significant differences in behaviour (of that reported in the home interview – chapter 4), e.g. rushing, leaving items on the floor, carrying, undertaking DIY activities, between the fallers and non-fallers in this sample. Despite this, it was apparent that hurrying and keeping clutter on the floor were contributors to the falls among this sample population, Table 5.2.
Lessons learnt and fear of falling

When questioned about how they felt post-fall, the majority of individuals (92%) reported that they would be more careful in future. A minority (4%) felt more fearful and a further 4% reported that since falling they were feeling both more fearful and careful, similar findings to the interview survey:

“I was rushing outside to the car as the car alarm was going off and I tripped on a little strip at the front door and pitched forward on to the driveway outside. Although it was one step down, I flew over the top of this step and ended up hitting my head on the little wall outside the front door. I also banged both of my knees and had a small fracture in my tibia, as well as lots of bruising. My plastic glasses were broken and my nose was broken. I also had whiplash and fractured my C2, and even a few weeks later have a curious pain in the back of my skull. I spent 5 days in hospital, and had a plaster on my leg for 5 weeks. I’ve learnt my lesson now – I’m quite wary.”

“I was rushing down the stairs as I was expecting a visitor. I was carrying a box and slipped on the last 2 steps. It wasn’t that I couldn’t see where I was on the stairs, more because I was in a hurry and tripped. Because I was carrying the box, I couldn’t steady myself by grabbing the handrail, so I slipped and fell onto my bottom. I just had a bit of bruising but I was stupid and I do take more care not to rush now.”

Perception of fall risk and impact upon behaviour

During the final telephone interview at the end of the year’s notification period, participants were asked several questions, Table 5 5.
Table 5.5 Impact of home interview on risk perception and behaviour

<table>
<thead>
<tr>
<th>Interview question</th>
<th>Response (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Since my visit have you felt more aware of the risks of falling?</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td>Since my visit have you changed any aspect of your behaviour due to fear of falling?</td>
<td>92</td>
<td>8</td>
</tr>
<tr>
<td>Would you continue to make any (more) changes to your behaviour due to fear of falling?</td>
<td>37</td>
<td>63</td>
</tr>
</tbody>
</table>

The majority (92%) of individuals reported having changed an aspect of their behaviour since the home interview due to fear or 'concern' about falling. Specific changes included 'trying not to hurry' and 'trying not to leave clutter lying about', Table 5.6, although the category with the highest frequency was that of 'take more care generally', with just under one half of all responses.

Table 5.6 Aspect of behaviour that was reported to have changed since the home interview

<table>
<thead>
<tr>
<th>Aspect of Behaviour</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take more care generally</td>
<td>42</td>
</tr>
<tr>
<td>Try not to hurry</td>
<td>17</td>
</tr>
<tr>
<td>Try not to leave clutter lying about</td>
<td>13</td>
</tr>
<tr>
<td>Take more care with/avoid certain footwear</td>
<td>12</td>
</tr>
<tr>
<td>Avoid carrying heavy, bulky items that obscure vision/</td>
<td>8</td>
</tr>
<tr>
<td>affect balance</td>
<td></td>
</tr>
<tr>
<td>Take more care with use of walking aids</td>
<td>4</td>
</tr>
<tr>
<td>Avoid standing on chairs</td>
<td>4</td>
</tr>
</tbody>
</table>

Of the 37% who reported that they would continue to make (more) changes to their behaviour due to a concern about falling, the types of changes were
rarely specific, Table 5.7. Although positive, they tended to be quite vague; only 5% of respondents gave specific examples of changes that they would make. The sample recognised (most likely from personal experience) that rushing affects risk of falling, and perceived that footwear and clutter can also increase risk of falling.

<table>
<thead>
<tr>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I'll make any changes that I think of or that I am recommended to make</td>
<td>42</td>
</tr>
<tr>
<td>I'll do anything sensible for when I get older</td>
<td>31</td>
</tr>
<tr>
<td>I'll slow down and be sensible generally</td>
<td>22</td>
</tr>
<tr>
<td>I'll change the type of footwear I wear</td>
<td>3</td>
</tr>
<tr>
<td>I'll keep the home as clear as possible because my... Parkinson's will get worse with age</td>
<td>2</td>
</tr>
</tbody>
</table>

Almost two thirds of the respondents (63%) stated that they would not continue to make any further changes to their behaviour. As well as the fact that individuals could not think of any further changes they could make (50% of responses), participants felt that it was unnecessary to make changes at the time of asking, or that falling was simply an inevitable part of aging, Figure 5.8.

"I'm happy that I'm doing all I can." Participant 36
"There's no point really – I'm going to fall anyway." Participant 5b
"When I'm old, I'll start thinking about it." Participant 64
"Apart from slowing down, which isn't in my nature, I can't see anything else that I could do." Participant 30
"I don't really think I need to worry about it at the moment." Participant 39

Figure 5.8 Examples of reasons for not changing behaviour
Participants were also asked whether since the researcher’s visit, they had ‘taken more care’ in their homes. Over three quarters (77%) of the sample reported that the interview had “made them think about fall risk in the home and take more care”. A small proportion of the group (15%) reported that the visit had not affected their way of thinking because they ‘had always taken care’. Less than 1 in 10 participants reported that the visit had had no influence on their subsequent behaviour (8%).

5.3.4 Relationship between falls and design of products and the home environment

The most common fall types of slipping and tripping (Table 5.1) were to a large extent caused by objects on the ground, and slippery and uneven surfaces (Table 5.2). These factors lead to implications for design with respect to: aesthetic, non-slip floor surfaces (indoor and outdoor); redesign/removal of (fixed) trip hazards, e.g. steps, raised thresholds; and, improvements in texture, type and level of surface. Of the 41% of falls that occurred in the garden, all were due to at least one of these factors.

Products and equipment also played a role in falls. The number of falls that involved personal aids, footwear and household objects and the environment are illustrated in Table 5.8.
Table 5.8 Environment and product related falls amongst the sample (multiple responses)

<table>
<thead>
<tr>
<th>Environment and Product Involvement</th>
<th>% of falls in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slipped on slippery surface (including ice/rain)</td>
<td>12</td>
</tr>
<tr>
<td>Tripped over change in surface (slab etc.)</td>
<td>10</td>
</tr>
<tr>
<td>Walking aid (tripping over/slipping)</td>
<td>10</td>
</tr>
<tr>
<td>Inappropriate footwear (slippery sole)</td>
<td>10</td>
</tr>
<tr>
<td>Fell from chair (whilst getting on/off)</td>
<td>7</td>
</tr>
<tr>
<td>Tripped over clutter</td>
<td>7</td>
</tr>
<tr>
<td>Fell down step</td>
<td>6</td>
</tr>
<tr>
<td>Pet related</td>
<td>4</td>
</tr>
<tr>
<td>Fell from bed</td>
<td>3</td>
</tr>
<tr>
<td>Tripped due to catching feet in bed covers</td>
<td>3</td>
</tr>
<tr>
<td>Tripped over small furniture (low table)</td>
<td>3</td>
</tr>
<tr>
<td>Fell off rockery whilst tending garden</td>
<td>3</td>
</tr>
<tr>
<td>Tripped on door strip</td>
<td>3</td>
</tr>
<tr>
<td>Tripped on clothing (whilst wearing)</td>
<td>1</td>
</tr>
<tr>
<td>Tripped over mat</td>
<td>1</td>
</tr>
<tr>
<td>Slipped whilst getting out of the bath</td>
<td>1</td>
</tr>
</tbody>
</table>

5.3.5 Relationship between falls, fall history and physical abilities

Of the sample, 36% of participants aged over 75 had fallen and 36% of participants aged over 80 had fallen. In this study, fallers were generally slightly older than non-fallers (mean 76 years compared to 74 years of age), and they had had more falls previously than non-fallers (mean of 1.07 compared to 0.77 previous falls per person). However, these differences were not significant. There were no significant differences in mechanism of fall (e.g. slip, trip), cause of fall, severity of injury or location of fall, and age category.

Although a proportion of falls were reported to be due to intrinsic risk factors, no differences were found for general fall related health problems between
fallers and non-fallers (93% and 91% respectively), mobility problems (55% and 59%), scores for activities of daily living (7.3 and 7.6), mean number of prescribed medications being taken (2.1 and 2.3 medications per day), type of accommodation lived in, or cohabitation status (43% of both groups lived alone).

It was statistically significant that male participants were more likely to fall due to a reported primary intrinsic risk factor, and females due to a reported primary behavioural risk factor, Table 5.9. As a result of this finding, further analysis was conducted to examine gender and MMBI score, although the outcome did not indicate any significant differences, Table 5.10.

<table>
<thead>
<tr>
<th>Causal Factor</th>
<th>Reported primary cause of fall (%)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Behaviour</td>
<td>7.1</td>
<td>51.2</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>25.0</td>
<td>24.4</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>67.9</td>
<td>24.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Male</th>
<th>Female</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>76.6</td>
<td>75.4</td>
<td>ns</td>
</tr>
<tr>
<td>MMBI Score</td>
<td>22.1</td>
<td>21.0</td>
<td>ns</td>
</tr>
</tbody>
</table>

There were no significant differences between gender and; recovery time, location of falls, type of fall/injury, or complexity of treatment required.

**5.3.6 Summary of key findings and comparison to findings from earlier studies**

It is apparent that behavioural risk factors were major contributors to the falls amongst this sample population. Behaviour was a primary contributory factor in one third (33%) of all reported falls over the course of the notification period. Rushing alone was reported to be causal in 28% of fall incidents. The
most common combinatory issues were rushing integrated with tripping over an object, which accounted for 13% of incidences. The use and design of footwear and walking aids appeared to be causal in a proportion of falls, confirming previous perceptions of risk (chapter 4). The role of slippery floor surfaces and changes in level (particularly in the garden) were obvious and endorsed suggestions from the earlier studies.

However, clutter and unfixed items on the floor were perhaps not as common place in fall causation as previously envisaged (chapters, 3 and 4). It was clear that older people in this population were at risk when carrying items, particularly large items that had a detrimental effect on balance. However, carrying bulky items which obscured vision did not appear to be as significant an issue as previously perceived, and poor vision contributing to falls was only reported to be a factor in a minimal amount of falls described during the notification period. Furthermore, although perceived as an issue in the home interview survey, the use or misuse of spectacles was not mentioned at any time as an issue in the reported falls over the year period. Conversely, the side effects or ‘latency periods’ of prescribed medication were raised on several occasions during the fall notification phase.

It was reported that a fall episode may alter behaviour and risk perception, although there were also reports to the contrary. It was reported that an educational home interview may increase awareness of fall risk, change risk perception, and result in changes to behavioural practices. Generally, the findings in this study concur with those implicated in chapters 3 and 4, whilst offering more detailed information on the precise causes of falls among a sample of older people.

Statistical tests were unable to confirm differences between the fall related behaviours or physical abilities of individuals who sustained a fall and those who did not, during the year period. However, there was significant anecdotal evidence that many different types of behaviour contributed to the fall risk among this population.
5.4 Discussion

This prospective study has used an accident-centred approach to examine fall causation among older people. Fall episodes have been investigated with particular attention paid to the behavioural and physical characteristics of individuals and their interaction with, and the design of their home environment. It was apparent that behavioural attributes and design aspects of the home played a considerable role in the reported falls amongst this cohort. Physical abilities and intrinsic factors were still a contending factor in fall risk, and the interaction between all categories of risk factors was interesting to examine.

Behaviour as a risk factor for falls among older people

It can be suggested that behavioural factors are strong elements in many falls. Little prior information to date exists due to the fact that behavioural risk factors are often ignored and unrecorded components due to a strong medical perspective of concentrating on intrinsic risk factors (chapter 2).

The strong relationship between falls in the garden and extrinsic risk factors demonstrates a need for improved design and a 'design for all' ethos. As well as reducing the risk of falling, physical activity has been shown to modify a significant number of the risk factors associated with falling (Skelton and McLaughlin, 1996) so it seems disappointing that some older people are trapped inside their homes, lacking the confidence and the ability to manage the environmental design challenges of their gardens, which are surroundings that could well be used to improve health, quality of life and independence.

Characteristics of the sample

Some research defines a faller as an individual who has had two or more falls in the past, and recurrent fallers are often defined as having had three or more previous falls over a defined period (Masud and Morris, 2001). This is an interesting distinction because some studies have shown that recurrent fallers suffer less severe injuries after a fall, whereas non-recurrent fallers may suffer more severe injuries (Koski et al, 1996). The findings from this study do not
back this up as there is no significant relationship between severity of injury and number of previous falls. Furthermore, it can be expected that older people who have a history of falling are more likely to fall again in future, due to frailty and loss of confidence. A slightly increased fall rate was found in this study although the finding was not statistically significant.

These insignificant findings may be due to the size of the sample, as well as their relative general health and youth, resulting in possible differences in behaviour and type of fall in comparison to previous studies conducted.

Proportions and interactions of fall risk

Participants occasionally reported that only one factor had played a role in a fall. However, when examining anecdotal evidence in light of earlier findings, it appears unlikely that many falls, if any, are caused by one sole risk factor. There was almost always a secondary or tertiary component involved, such as a psychological (classified as an intrinsic) issue, e.g. experience, expectation, recognition.

It is apparent from examining the individual, the environment and the behaviour (task) directly heralding a fall that there are many variables that can be 'juggled' before a fall is sustained. Lord et al (2001) discussed the interaction between an individual's capabilities and the environment, stating that as a person's physical abilities deteriorated, the environmental demands have to be lower for the individual to be able to cope. However, this model does not take into account the behaviour performed in the environment by the individual. For example, if a frail older woman (Female 'A'), with impaired proprioception and balance, is walking down her garden path and encounters a change in surface, she may be able to overcome the environmental challenge and sustain postural control. However, if the same older woman is rushing down the same path, whilst carrying a basket of washing in front of her, she may not be able to overcome the environmental challenge and could sustain a fall: the behaviour of carrying the washing basket which obscures vision, is one risk factor. However, this behaviour additionally impacts upon the intrinsic and extrinsic risk factors. The additional speed diminishes the
stability of her gait, and so reducing balance ability. The obscured visual field results in the environmental hazard being hidden, which implicates decline for levels of awareness, expectation of hazard, and concentration, hence increasing the hazard potential. Therefore, the sum of the overall risk is greater than the sum of the individual risk factors. These factors have a negative impact on the female’s already weak intrinsic ability, as well as increasing the hazard potential. When a point is reached, the individual is unable to cope with the extrinsic demands and a fall event occurs. These and some other possible scenarios for Female ‘A’ are visualised in ‘quantities of fall risk’, to illustrate the proportions of fall risk and the augmenting impact that the risk factors have on each other, Figure 5.9.

<table>
<thead>
<tr>
<th>Description of scenario and risk</th>
<th>Relative proportion of risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frail female, walks at speed along garden path, whilst carrying washing basket in front of her*</td>
<td></td>
</tr>
<tr>
<td>Frail female, walks at speed along garden path, whilst carrying washing basket on one hip</td>
<td></td>
</tr>
<tr>
<td>Frail female, walks at speed along garden path,</td>
<td></td>
</tr>
<tr>
<td>Frail female, walks along garden path</td>
<td></td>
</tr>
</tbody>
</table>

Key:  
- Extrinsic risk,  
- Intrinsic risk,  
- Behavioural risk,  
* Fall

Figure 5.9 Proportions of fall risk for Female ‘A’
It can be suggested from this examination of fall causation that the proportions of the three overlying risk factors (intrinsic, extrinsic and behavioural) can vary in each fall event, dependent on the individual, the environment and the behaviour (task) but that all components are interacting and multi-dependent. It is comprehensible that as another risk factor is added to the scenario, the impact that it can have on the other areas of risk may increase the overall risk by a significant proportion.

The fall event marks the point where a person is no longer able to overcome the environmental and physical challenges that have been placed on them by their ability, the environment and their choice of behaviour. This instance is different for every individual, in any given situation. At this point, the demands outweigh the coping strategies and a fall occurs. Figure 5.10 demonstrates this principle: when an individual is in any one setting at a point in time, the environmental hazards and the individual's ability are fairly constant and create a challenge for the person to overcome when conducting a task. However, the behaviour (or task) can vary, and depending on the individual's choice of behaviour (e.g. walking normally, rushing, etc.), the challenges to postural stability can increase dramatically. The individual can use their own established coping strategies to overcome the challenges, unless the challenges are so great at that point in time that they are unable to cope and a fall event occurs.
Due to the enormous variety of factors that are recognised as affecting fall risk, it is extremely rare that any two people have the same relative risks. Compared to Female 'A', if an able older man (Male 'B') were to conduct the same task (of rushing down an uneven footpath whilst carrying a loaded basket), he may not fall. This could be because his physical capabilities are superior, or because he has a better recognition of the risks and chooses to carry the basket to one side of his body so that he can observe the ground as he walks at speed. It is apparent that every individual has a maximum combination of challenges that they can cope with, hence their own personal fall event boundary. Figure 5.11 attempts to visualise comparative scenarios of several individuals, in related quantities of fall risk.
**Figure 5.11 Proportions of fall risk for a variety of older people**

If a large study were conducted and designed to specifically quantify the risks involved in fall episodes, a points system could be used to attribute extent of risk to different older people. This may assist with better understanding of an individual's risk factors and improved efficiency when targeting interventions.

Figures 5.9 and 5.11 are also useful tools to emphasize the contribution of behaviour to fall risk and the many interactions that occur during a fall episode, and could be presented to medical professionals who have previously disparaged the contribution of behaviour to fall risk.
Implications for types of falls

Although there were no significant differences between any of the fall risk factors (age, gender, physical ability, previous falls, etc.) and location, mechanism, cause, time of fall, or severity of fall sustained injury, it can be suggested that falls can be differentiated into categories. The findings have inferences for types of falls because falls appear to be instigated by active, modifiable choices and behaviours, e.g. choosing to carry a bulky object, choosing to wear specific footwear, choosing to leave a trip hazard on the floor:

“I was wearing my new shoes which have got quite high heels and are quite slippery on the bottom... I was in a rush to go out. I hurried downstairs and slipped and fell as I was halfway down.”

Other falls appear to be instigated by inactive, latent factors (e.g. health and physical ability, design of a low friction floor surface, design of internal staircase/steps):

“I was just walking through my living room when I had a bit of a dizzy turn. I knocked into the table and fell on to the carpet.”

Whether latent or active factors contribute to subsequent falls is dependent on the intrinsic characteristics of the individual (physical and mental capabilities, peripheral support and ensuing psychological belief and awareness), the extrinsic design of the environment, and the task (behaviour) that is being carried out.

Both these categories of fall episode are impacted upon by understanding and knowledge of fall risk and choice, which make the difference between how a person does behave, e.g. how they furnish their environment, how they move about, and how a person could behave to reduce fall risk, e.g. how they could choose to furnish their environment, how they could choose to move about their home. Choice and decision making are all dependent on physical and psychological health, fall history, socio-economic status, pressure and support.
from family and health professionals, and product and equipment interaction. An individual's behaviour affects an individual's psychological perspective, physical and mental capabilities, and environmental and peripheral influences, each of which in turn have an impact on behaviour and on each other.

Unexpected findings

Gender differences
Just under half (41%, n=28) of the reported fall incidents were from male participants. This figure is very high for the proportion of male participants (27%). One would expect, due to chance, the proportion of falls for each gender to be similar to the proportion of participant genders. One could even estimate an increased number of female falls in proportion to female participant numbers; being aged over 65 and female are two of the main risk factors for falls among the older population (Lord et al 2001). It was anticipated that these discrepancies may be due to differences in the relative health of the male and female participants in this study, as male participants were more likely to fall due a reported primary intrinsic risk factor (p<0.001), however there were no significant differences between MMBI score and gender. However, after further examination of the data, it was apparent that the data may have been skewed by one male participant with a very high reported incidence of falls over the notification period (n=12). Parkinson's disease may result in falls and reduced quality of life but this may not be reflected with the use of the modified 'modified Barthel Index' as sufferers of this condition are often able to continue with activities of daily living due to the use of medication. It is when the effects of the medication wear off that individuals' may be prone to falling:

"I was in the lounge and fell when my foot got caught under the base of the bed, and I lost my balance and fell. I didn't hurt myself - I just felt foolish. I was carrying a jug - although I could see where I was going - which broke when I dropped it as I fell. I had my slippers on, but that was nothing to do with it - it was about 5pm and my tablets were
wearing off so I was a bit wobbly. I should really have been using my walking stick but I thought I'd be ok as I wasn't really going anywhere.”

**Temporal variation**

The most common times of day for falls to occur were between 6am-12 noon (43% of fall incidences) and 12 noon-6pm (39% of fall incidences), a not unexpected result as it would be anticipated that falls occur during the most active times of the day (Lord et al 2001). However, it is interesting that there was such a tailing off in the data between the hours of 6pm and midnight (11% of falls occurred in this period), with less than a third as many falls occurring during this time. It can be suggested that the sample in general tended to retire to bed early in the evening, and so were only active for half this period, although this still does not account for the small frequency of fall events during this period.

There were significant differences ($p<0.01$) between the seasons for the primary reported casual factors of falls. There were significantly more reports of behaviour being a primary factor in the winter months than in the spring, summer or autumn periods. Furthermore, intrinsic risk factors were less commonly reported in the winter season compared to the other periods of the year, Figure 5.8. It may have been expected that more behavioural and extrinsic risk factors would have been reported during the warmer months, when it could be expected that people are more active and undertaking more hazardous actions. However, it is impossible to hypothesize about this as data on general activities during the course of the year was not collected. The behavioural element of falls in the winter months could possibly be explained by examining the descriptions of the fall incidences dependent on time of year. There do appear to be several accounts of people hurrying when in the garden (in icy weather) during the winter months, in order to 'get inside out of the cold' which could go some way to accounting for this difference.

When examining the breakdown for falls per month, there are discrepancies in numbers of falls for the months of August and March. These may be due to chance alone. However, if examining these months with regard to types of
behaviour and activity, these are other possibilities. The reduced fall rate from February to March may be due to improved weather conditions (e.g. less ice and slippery surfaces), although the weather may still not be good enough for participants to spend much time in their gardens. The increase in April may mark the start of more gardening activity, correlating with the large number of falls that occur in the garden (41%). A reduced number of falls specific to the month of August may be due to people going on holiday, or a period of hot weather resulting in less gardening activity due to discomfort. This further examination of data continues to exhibit that behaviour (and actions) have a strong interaction with fall risk.

Implications for frequency rates

Estimates of fall incidence
After more than two decades of research into the area, a sufficient quantity of convincing studies have been completed to give the reliable estimates of fall incidence among community dwelling older people, Table 5.11. The figures found in this study are relatively close to the “young old” and “middle old” age groups. However, the incidence for the oldest group is slightly lower than previous estimates. It is unknown whether this is a reflection of uncaptured fall data, behavioural changes due to improved awareness, a healthier than normal sample or simply owed to chance.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Incidence in this study (%)</th>
<th>Incidence in previous studies (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>65+</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>75+</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>80+</td>
<td>36</td>
<td>50</td>
</tr>
</tbody>
</table>


Estimates of injurious falls amongst UK older population
The results state that although 84% of fall episodes resulted in some degree of injury, only 25% of falls resulted in hospital treatment or visits to the GP.
This is an interesting indication. According to HASS data, over 370,000 falls resulted in A&E admission in 2002 (DTI 2003). If this figure is only one quarter of all falls that are being sustained amongst community dwelling older people, then a cautious total figure could be 1.4 million falls per year amongst individuals aged 65 and over. The data in this study are also reflective of the 'best-case scenario' as the sample are, on average, biased towards fitter, younger and healthier examples of the older population. Despite this, however, the type and severity rates of varying injuries reported in this study are all higher (except hip fracture rate, which is similar) than the rates reported in other studies (Table 5.4). This could suggest that the current suggestions for injury frequency and severity resulting from older people falling in the home, are somewhat conservative.

The impact of an educational home visit upon fall related behaviour and risk perception

Just over half of the sample reported that the home interview they had experienced one year prior to their final telephone interview had made them feel more aware of the risks of falling (41%). This has interesting implications for falls education and prevention. However, an even larger proportion (92%) of the sample reported changing an aspect of their behaviour since the interview. This is an incongruity as the figure for 'awareness of risks' is far lower than the reported 'changes in behaviour' despite the fact that an affirmative response for the latter is likely to be linked with an affirmative response for the former. It may be that participants' responses were influenced by the fact that the same researcher was asking them about their previous home interview and that members of the cohort felt that they should report positively to reflect well on the researcher's ability. It is unlikely that perceived risk of falling is independent of a reported change in behaviour because previous responses, both qualitative and quantitative in earlier chapters indicate that risk perception impacts upon one's behaviour.

Future changes to fall-related behaviour

Of the 37% of the sample who stated that they would continue to make changes to their behaviour with respect to falling, the vast majority of
responses were corresponding to “I’ll make any (future) changes I need to”. This suggests that a large proportion of the overall participants were receptive to change, but additionally that these older people were not entirely definite about the steps they could put in place to reduce fall risk as they become older and/or less able.

This was endorsed with the responses examining the reasons for not making any further changes: 50% of these individuals could not think of any further changes they could make to their behaviour, with the remainder of this subgroup responding that changes to their behaviour were “unnecessary” or “pointless”. It could be suggested from these findings that education should play a role in enlightening older people at risk of falling about the issues and the steps they can make, in order that they know what they are able to do as they get older.

Intervention programmes which evaluate a single aspect of falls injury prevention (e.g. exercise programmes, use of hip protectors) are clearly valuable for assessing the efficacy of factors operating in isolation. However, the benefit from multifactorial efforts has been shown to often be greater than the sum of the individual components (Close et al 1999, Gillespie et al 2003). While there remains consensus regarding the likely efficacy of these approaches, there is as yet no widely agreed model for delivering these programmes as services (as opposed to experimental interventions). As a result, the falls prevention literature offers little information of the likely uptake of, or organisational barriers to falls prevention programmes when offered within the context of everyday social and health care.

5.4.1 Quality and limitations of data

Although the sample size was fairly small with 150 participants, the quality and detail of the data give a greater depth than has previously been reported, particularly with regard to the interaction between the different types of risk factors.
Recall of falls

Cummings et al. (1988) found that in retrospective studies, recall of falls among older people is underestimated by 13-22% compared to prospective studies, depending on the time period of recall. It has also been found in prospective studies that the methodology used in data collection can influence the incidence (Fujimoto et al. 2000). Most falls reported in this study were recorded within a short time period, so it would be anticipated that this was fairly reliable data on causal factors of falls. Nevertheless, it is possible that incidences may have been forgotten or overlooked in their significance, resulting in a degree of missing recall. It is also possible that there may have been some degree of apathy amongst the sample. Data collection may have been improved by increasing the number of contact events (e.g. phone calls, letters) with the sample.

Subjective discrepancies in reported data

As well as cases of unreported data, it is also possible that subjective opinions and personal requirements distorted the truth of causal factors to some extent. An example of this may be that an individual wants to believe that a fall was due to a simple trip instead of a decline in health and mobility that they were unable to admit to. It may also have been difficult for participants to identify ‘causes’ of falls correctly. Furthermore, it is possible that having built up a rapport with the researcher, the participants may have answered in a way in which they felt was appropriate, instead of giving their true attitudes.

Additional and more accurate information may have been obtained by conducting home visits and interviews with the participants rather than telephone interviews, in order to get individuals talking through exactly what happened when they fell. This was, however, not possible with the remit of this study and the time and resources involved.

5.4.2 Implications for future project research

This study and earlier investigations (chapters 3, 4) have both raised issues for the design of the garden and the home environment. It would be
interesting to investigate some of the design problems further to see if they could be overcome with the development of a 'smart' home environment.

Implications have been raised for the relationship between weather conditions and falls. A study conducting detailed analysis of annual weather patterns and the frequency and causes of outdoor falls among older people could result in a better understanding of the processes involved and methods for successful intervention.

It was reported retrospectively that the one to one home interviews a year early had raised awareness levels and promoted healthier behaviour. It was also reported that knowledge of other people's falls may impact upon perception and subsequent behaviour. These issues would be interesting to examine further, particularly with respect to the role of different types of education on fall perception and fall risk, and whether this can be targeted for different types of people with different levels of awareness.

5.5 Summary and conclusions

If falls are to be reduced amongst this population, it is imperative that all aspects of fall causation are well considered and appropriately addressed. Behaviour is shown to be a key contributory factor in fall risk. Opportunities exist to reduce the risk of older people falling in and around the home, with respect to the design of products and buildings. Clearly, if the incidence of falls can be reduced, people can live for longer, both more healthily and more independently, in their own homes.
Chapter 6

CONSULTATION OF HEALTH PROFESSIONALS: PERCEPTION OF FALLS AMONG OLDER PEOPLE

6.1 Introduction

6.1.1 Outline of research presented in chapter

Asking stakeholders in a system is an acknowledged way of gathering data about the said system (Oppenheim 1966). Much of the published literature on falls appears to be produced by senior medical staff (Hughes 2002) and, therefore, biased towards a medical perspective. However, according to the NSFOP (DoH 2001), a variety of different types of professionals should be involved in fall prevention activities. The purpose of the research presented in this chapter was to identify perceptions from a variety of health professionals within the National Health Service, who work with older fallers. Of specific interest was to examine what these professionals believe are the main causes of falls, the best ways of preventing falls, and the main problems in the practice of prevention. As discussed in chapter 2, many of these aspects have been studied in great detail in the literature, with the use of randomised control trials etc. to investigate the best approach to the problem. However, there does not seem to be any work that has investigated how health professionals who have been tasked to tackle the epidemic of falls in these recommended ways actually feel about such approaches. Furthermore, some of the issues for older people's behavioural non-compliance have been captured in earlier chapters (3, 4, 5). It was deemed useful to investigate these from a practitioners viewpoint and to elicit whether they are perceived as concerns in fall prevention.

Therefore, this chapter of research attempts to uncover the attitudes of health professionals by means of a questionnaire survey, requiring quantitative and qualitative responses. The results are examined on their own merit. They are also compared to the key findings and recommendations in the literature.
(Chapter 2). The use of a questionnaire was chosen to obtain large amounts of data from a large sample, relatively quickly, and time and cost efficiently. It is also a suitable technique for undertaking exploratory investigation into a previously unresearched area, and to draw upon the knowledge of the respondents, as stakeholders. The questionnaires asked respondents to provide information regarding factors that are often recognised to affect fall risk and fall prevention.

6.1.2 Aims

- To examine what health professionals perceive, based on their experience, are the:
  - Main factors causing falls (in order of importance)
  - Most successful methods of preventing falls (in order of success)
  - Key problems in trying to reduce falls among older people

- To compare these perceptions to those in the scientific literature and to examine any differences

- To investigate whether there are any differences in opinions of health professionals dependent on job roles, working environments, and experience

- To draw up a set of recommendations for guidance on design and development of future falls pathways

6.2 Methods

6.2.1 Participants

Falls experts were targeted through their attendance at two specialist conferences convened to discuss the topic of falls and postural stability. The symposia selected were the Conference for Falls Prevention and Management in Older People (Ipswich, June 2002) and the 3rd National Conference on Falls and Postural Stability (London, September 2002). The
conferences were expected to attract National Health Service (HNS) health professionals working with older people at risk of falling, as well as individuals in health and social care management roles.

6.2.2 Procedures

The views of professionals working in the area of falls, postural stability and geriatrics were sought. The questions asked were based on implications and conclusions of the literature review, focus groups and interview survey.

The Expert Consultation Questionnaire (Appendix D) was inserted into the conference delegate packs at two specialist conferences. During each conference, the delegates were requested by the conference organiser to complete the questionnaires and return, upon completion, to the collection box on the conference registration stand. The researcher’s FREEPOST address was also provided at the end of the questionnaire.

6.2.3 Questions

Information was sought on the respondent’s current role and work environment and the duration they had been working in this role. The first set of questions asked respondents to rank, in order of importance, a list of 11 recognised risk factors for falls among older people. They were asked to do this based on their personal experience. The risk factors included:

- Frailty
- Effect(s) of medications
- Risky behaviour (e.g. rushing, carrying items)
- Poor nutrition
- Vision
- Low lighting levels
- Alcohol consumption
- Trip and slip hazards
- Lack of awareness
- Footwear
- Combination of many risk factors

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The second set of questions asked respondents to rank a list of 9 methods of preventing falls, and injuries from falls, among older people, in order of perceived success. Again, they were asked to do this based on their experience. The prevention strategies included:

- Exercise interventions
- Individual assessment (including review of medications)
- Home assessment (e.g. advice on home hazards, environmental changes)
- Equipment to reduce falls (e.g. grab rails)
- Nutritional supplements
- Clothing to reduce fall injury (e.g. hip protectors)
- House design
- General education on fall risk
- Advice on footwear

The third section asked respondents to rate a series of issues, found in the literature and from the researcher's previous studies, to be factors in falls prevention. Again, respondents were asked to answer each question based on their experience as a health professional. A 7-point Likert scale was used for the respondents to circle a suitable response. Issues covered in this section included:

- Older people are set in their ways and won't heed my advice
- Insufficient time or money is available to support my activities
- Lack of commitment from my colleagues
- Lack of commitment from my superiors
- Insufficient materials (e.g. leaflets) available to give to older people
- Inadequate materials available to give to older people
- Falls occur largely by chance and are difficult to prevent

Finally, respondents were asked to add any other comments they may have about falls among older people, their prevention, or their causes.
The questionnaire was piloted with 10 health professionals prior to full data collection. Respondents were asked to note whether they understood the questions and to provide general feedback on the questionnaire. Minor changes to the wording were made as a result.

6.3 Results: data analysis

A total of 117 questionnaires were completed, 48 from the Ipswich conference and 69 from the London conference (response rates of approximately 26% and 20% respectively). The findings were analysed as one data set and are described as such throughout. This is justified as the conferences were of a very similar theme and as such attracted similar delegates.

6.3.1 Information about the sample population

Coding of the data demonstrated that the respondents were from a large pool of disciplines, Table 6.1. The majority were classified as occupational therapists, physiotherapists, medical physicians, or nurses. The ‘Other’ category included individuals working in health commissioning roles, paramedic/ambulance workers, social workers, home carers, and podiatrists.

<table>
<thead>
<tr>
<th>Job Role</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and social care management</td>
<td>10</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>24</td>
</tr>
<tr>
<td>Nurse</td>
<td>16</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>20</td>
</tr>
<tr>
<td>Home visitor/day care, e.g. social services, home</td>
<td>10</td>
</tr>
<tr>
<td>carer</td>
<td></td>
</tr>
<tr>
<td>Medical physician</td>
<td>19</td>
</tr>
</tbody>
</table>

When reporting the number of years in their current role, the responses varied between 1 and 34 years (mean 9.54 years, SD 8.4). When looking at experience, that is a total of 1106 years experience between all respondents.
The respondents reported to work in a variety of settings including hospital and community environments. The open responses were coded by the researcher into four general categories, which were dependent on the primary work environment. The work environments were divided into ward based inpatients, ward based outpatients (including falls clinics and community hospital roles, day care (including professionals who visit care homes and older people's homes), and office based roles. This was in order to differentiate any trends that may emerge dependant on whether or not the professional had personal contact with older fallers, and whether or not they visit older fallers in their homes, or simply in a hospital environment. It was hypothesised that differences in opinions may result due to the nature of the experience. The breakdown is shown in Table 6.2. Tables 6.3 and 6.4 illustrate the variation between work environment and job role and work environment and duration of time in the job.

Table 6.2 Primary work environments of respondents

<table>
<thead>
<tr>
<th>Detailed Work Environment</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward based inpatients</td>
<td>28.4</td>
</tr>
<tr>
<td>Ward based outpatient, falls clinic, community hospital role</td>
<td>50.0</td>
</tr>
<tr>
<td>Day centre, care homes, visiting OP</td>
<td>13.8</td>
</tr>
<tr>
<td>Office based role (little interaction with OP)</td>
<td>7.8</td>
</tr>
</tbody>
</table>
### Table 6.3 Work environment by job role

<table>
<thead>
<tr>
<th>Profession / %</th>
<th>Ward based inpatients</th>
<th>Ward based outpatients, comm hosp role</th>
<th>Day centre, care/OP homes</th>
<th>Office based role</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and social care management</td>
<td>0.9</td>
<td>4.3</td>
<td>2.6</td>
<td>6.0</td>
<td>13.8</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>6.9</td>
<td>13.8</td>
<td>3.4</td>
<td>-</td>
<td>24.1</td>
</tr>
<tr>
<td>Nurse</td>
<td>4.3</td>
<td>11.2</td>
<td>-</td>
<td>0.9</td>
<td>16.4</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>7.8</td>
<td>10.3</td>
<td>1.7</td>
<td>-</td>
<td>19.8</td>
</tr>
<tr>
<td>Home visitor/daycare</td>
<td>-</td>
<td>0.9</td>
<td>5.2</td>
<td>0.9</td>
<td>6.9</td>
</tr>
<tr>
<td>Doctor</td>
<td>8.6</td>
<td>9.5</td>
<td>0.9</td>
<td>-</td>
<td>19.0</td>
</tr>
<tr>
<td>Total</td>
<td>28.4</td>
<td>50.0</td>
<td>13.8</td>
<td>7.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 6.4 Work environment by time in the job

<table>
<thead>
<tr>
<th>Profession / %</th>
<th>0-4 years</th>
<th>5-9 years</th>
<th>10-14 years</th>
<th>15+ years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and social care management</td>
<td>9.6</td>
<td>2.6</td>
<td>0.9</td>
<td>0.9</td>
<td>13.9</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>8.7</td>
<td>6.1</td>
<td>1.7</td>
<td>7.0</td>
<td>23.5</td>
</tr>
<tr>
<td>Nurse</td>
<td>3.5</td>
<td>1.7</td>
<td>-</td>
<td>11.3</td>
<td>16.5</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>5.2</td>
<td>3.5</td>
<td>2.6</td>
<td>8.7</td>
<td>20.0</td>
</tr>
<tr>
<td>Home visitor/daycare</td>
<td>3.5</td>
<td>1.7</td>
<td>0.9</td>
<td>0.9</td>
<td>7.0</td>
</tr>
<tr>
<td>Doctor</td>
<td>7.8</td>
<td>7.0</td>
<td>2.6</td>
<td>1.7</td>
<td>19.1</td>
</tr>
<tr>
<td>Total</td>
<td>38.3</td>
<td>22.6</td>
<td>8.7</td>
<td>30.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>
6.3.2 Risk Factors for Falls

All of the risk factors (except low lighting levels) were attributed a top rank score on at least one occasion (therefore by at least one person). Equally, all factors (except effect(s) of medications) were attributed a rank score outside the top ten for importance on at least one occasion, Table 6.5.

Table 6.5 Rank score for risk factors causing falls among older people

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>N of Unranked Responses</th>
<th>Highest Rank</th>
<th>Lowest Rank</th>
<th>Mean Rank</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of risk factors</td>
<td>22</td>
<td>1</td>
<td>11</td>
<td>2.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Frailty</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Effect(s) of medications</td>
<td>6</td>
<td>1</td>
<td>9</td>
<td>4.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Trip and slip hazards</td>
<td>4</td>
<td>1</td>
<td>11</td>
<td>4.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Risky behaviour</td>
<td>7</td>
<td>1</td>
<td>11</td>
<td>4.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Vision</td>
<td>4</td>
<td>1</td>
<td>10</td>
<td>5.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Lack of awareness</td>
<td>9</td>
<td>1</td>
<td>11</td>
<td>5.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Footwear</td>
<td>10</td>
<td>1</td>
<td>12</td>
<td>6.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Poor nutrition</td>
<td>10</td>
<td>1</td>
<td>12</td>
<td>7.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Low lighting levels</td>
<td>8</td>
<td>2</td>
<td>12</td>
<td>8.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>10</td>
<td>1</td>
<td>12</td>
<td>8.6</td>
<td>2.4</td>
</tr>
<tr>
<td>(Other risk factor)</td>
<td>94</td>
<td>1</td>
<td>12</td>
<td>3.2</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Figure 6.1 shows the frequencies for each risk factor when attributed a high, medium or a low ranking (see Table 6.6 for clarification of categorisation), and the frequency of unranked responses.

Table 6.6 Ranks of causal factors in falls

<table>
<thead>
<tr>
<th>Revised Category</th>
<th>Previous Rank Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Ranked Causal Factor</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>Medium Ranked Causal Factor</td>
<td>5, 6, 7</td>
</tr>
<tr>
<td>Low Ranked Causal Factor</td>
<td>8, 9, 10, 11</td>
</tr>
</tbody>
</table>
When the whole listing of risk factors is divided into intrinsic, extrinsic and behavioural risk factors, the results are interesting, Table 6.7. The figures demonstrate that after the combination approach, the category of behavioural risk factors is perceived as the next most important. It is also interesting that extrinsic risk factors are perceived as the least important.

Table 6.7 Mean rank scores for categories of risk factors

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Rank Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of all risk factors</td>
<td>2.4</td>
</tr>
<tr>
<td>Behavioural risk factors</td>
<td>5.4</td>
</tr>
<tr>
<td>(risky behaviour, lack of awareness)</td>
<td></td>
</tr>
<tr>
<td>Intrinsic risk factors</td>
<td>5.8</td>
</tr>
<tr>
<td>(frailty, effect of medications, vision, poor nutrition, alcohol consumption)</td>
<td></td>
</tr>
<tr>
<td>Extrinsic risk factors</td>
<td>6.5</td>
</tr>
<tr>
<td>(trip and slip hazards, footwear, low lighting levels)</td>
<td></td>
</tr>
</tbody>
</table>

A number of other risk factors had been added to the list by respondents (in the 'Other' category). These included: cognitive impairment/dementia (x9); gait/balance disturbance (x3); poor use/misuse of walking aids (x2); postural hypotension (x2); cardiac arrhythmias; stroke; vestibular impairment; carotid sinus syndrome; hearing; co-morbidity of other conditions including Parkinson’s disease (x2); confidence loss and reduced activity; neuromuscular or skeletal problems; neurological problems; illness affecting chronic med conditions; loss of mobility.
It can be seen that these data tend to reflect the mean rank score data for each risk factor, Table 6.5. The risk factors with the higher mean rank scores have the higher percentages of high rank responses. The risk factors with the lower mean rank scores have the higher percentages of low rank responses.

The mean rank scores for all risk factors ranged between 2.4 and 8.6, Table 6.5. The main cause of falls according to the mean rank is a combination effect of many of the risk factors, followed by frailty, effect(s) of medication, trip and slip hazards, and risky behaviour. Alcohol consumption was not thought to play a significant role in falls, scoring the lowest importance. Nor
were low lighting levels, poor nutrition and footwear thought to be significant risk factors in falls among older people.

When looking at the frequency of the responses for each rank and risk factor (Figure 6.2) these initial data are reinforced. It is apparent that the combination of many risk factors is ranked as most important by over half (54%) of the respondents, followed by frailty (21%), medication effects (8.5%), risky behaviour (7.7%), and slip and trip hazards (5%).

Figure 6.2 Frequency of responses (%) for rank and risk factor
6.3.3 Relationships between risk factors and participant information

Significance tests were conducted in order to examine whether any relationships were present between the way in which the risk factors for falls were ranked and the job role of the respondents, their time in job and their working environment. The $\chi^2$ test and the Mann-Whitney U-test were used to assess relationships and their significance. Significance was shown at a p value of 0.05 or less.

Distribution of ranks by job role

The categories of job role (Table 6.1) were used to carry out analyses of relationships between causal ranks and job role. In order to boost reliability of the $\chi^2$ test, the individual rank values were amalgamated into groupings of high, medium and low ranks, when undertaking the analysis, Table 6.6. The significant differences in ranking responses between risk factors and the different job roles have been detailed in Table 6.8.
Table 6.8 Risk factors: mean of ranks by job role (with significant differences shown)

<table>
<thead>
<tr>
<th>Job Role</th>
<th>Mean Rank Score for Each Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combination of all risk factors</td>
</tr>
<tr>
<td>Health and social care management</td>
<td>1.5</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>2.9</td>
</tr>
<tr>
<td>Nurse</td>
<td>3.4</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>1.6</td>
</tr>
<tr>
<td>Home visitor/day care, e.g. social services, home carer</td>
<td>4.6</td>
</tr>
<tr>
<td>Medical physician</td>
<td>2.0</td>
</tr>
</tbody>
</table>

KEY: Significant differences are shown as: [p<0.05] [p<0.01] [p<0.001]
Distribution of ranks by working environment

As detailed in Tables 6.2-6.3, the respondents reported to work in a variety of settings including hospital and home environments. It was hypothesised that differences in opinions may result due to the nature of the experience. The categories used to examine whether any relationships were present between the way in which the causal factors for falls were ranked and the working environments of the respondents, were those detailed in Table 6.3. The relationship data has been summarised in Table 6.9.
Table 6.9 Risk factors: mean of ranks by working environment (with significant differences shown)

<table>
<thead>
<tr>
<th>Working Environment</th>
<th>Mean Rank Score for Each Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combination of all risk factors</td>
</tr>
<tr>
<td>Ward based inpatients</td>
<td>2.0</td>
</tr>
<tr>
<td>Ward based outpatients, community hospital role</td>
<td>2.3</td>
</tr>
<tr>
<td>Day Centre, care homes, older people's homes</td>
<td>3.7</td>
</tr>
<tr>
<td>Office based roles</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**KEY:** Significant differences are shown as: [p<0.05] [p<0.01] [p<0.001]
Distribution of ranks by number of years in job

When reporting the number of years in their current role, the responses varied between 1 and 34 years (mean 9.54 years, SD 8.4). The categories used to examine whether any relationships were present between the way in which the causal factors for falls were ranked and the number of years experience in the job (and therefore, attitude and training), were those detailed in Table 6.10.

<table>
<thead>
<tr>
<th>Years in Role</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>44</td>
<td>38.3</td>
</tr>
<tr>
<td>5-9 years</td>
<td>26</td>
<td>22.6</td>
</tr>
<tr>
<td>10-14 years</td>
<td>10</td>
<td>8.7</td>
</tr>
<tr>
<td>15 years plus</td>
<td>35</td>
<td>30.4</td>
</tr>
</tbody>
</table>

The relationship data has been summarised in Table 6.11.
Table 6.11 Risk factors: mean of ranks by time in job (with significant differences shown)

<table>
<thead>
<tr>
<th>Time in Job</th>
<th>Mean Rank Score for Each Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combination of all risk factors</td>
</tr>
<tr>
<td>0-4 years</td>
<td>2.1</td>
</tr>
<tr>
<td>5-9 years</td>
<td>2.8</td>
</tr>
<tr>
<td>10-14 years</td>
<td>1.4</td>
</tr>
<tr>
<td>15+ years</td>
<td>2.9</td>
</tr>
</tbody>
</table>

KEY: Significant differences are shown as: $\bigcirc p<0.05$, $\bullet p<0.01$, $\bigcirc p<0.001$
6.3.4 Methods of fall prevention

The respondents were asked to rank in order of importance a list of 9 methods of preventing falls (including injuries from falls), based on their personal experiences. These methods of intervention have all been researched in the literature, chapter 2. Respondents bestowed a rank of ‘1’ to the intervention they perceived to be the most successful in preventing falls among older people, a rank of ‘2’ to the factor perceived to be the next most successful, and so on. This same ranking system has been used in Table 6.12 where it can be seen that all of the interventions (except clothing to reduce falls) scored a top rank on at least one occasion. Equally, all were ranked outside the top five for most beneficial intervention on at least one occasion.

Table 6.12 Rank score for interventions to prevent falls among older people

<table>
<thead>
<tr>
<th>Intervention</th>
<th>N of Unranked Responses</th>
<th>Highest Rank</th>
<th>Lowest Rank</th>
<th>Mean Rank</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual assessment</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>1.5</td>
<td>0.9</td>
</tr>
<tr>
<td>Home assessment</td>
<td>6</td>
<td>1</td>
<td>9</td>
<td>3.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Exercise interventions</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>3.8</td>
<td>2.1</td>
</tr>
<tr>
<td>Equipment to reduce falls</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>4.1</td>
<td>1.8</td>
</tr>
<tr>
<td>General education on fall risk</td>
<td>4</td>
<td>1</td>
<td>9</td>
<td>4.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Advice on footwear</td>
<td>7</td>
<td>1</td>
<td>9</td>
<td>5.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Nutritional supplements</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>6.7</td>
<td>2.0</td>
</tr>
<tr>
<td>House design</td>
<td>9</td>
<td>1</td>
<td>9</td>
<td>6.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Clothing to reduce fall injury</td>
<td>7</td>
<td>2</td>
<td>9</td>
<td>7.0</td>
<td>2.1</td>
</tr>
<tr>
<td>(Other intervention)</td>
<td>99</td>
<td>1</td>
<td>8</td>
<td>2.6</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Figure 6.3 shows the frequencies for each intervention measure when attributed a high, medium or low ranking (as per Table 6.6), and the frequency of unranked (missing) responses.
Figure 6.3 Grouping of intervention method rankings into high, medium and low rank categories
When the whole listing of intervention measures is divided into intrinsic, extrinsic and behavioural methods of fall prevention, the results are interesting, Table 6.13. The figures demonstrate that after the holistic approach, the category of behavioural intervention measures is perceived as next most successful. Extrinsic intervention measures are perceived as the least successful method of preventing falls.

Table 6.13 Mean rank scores for categories of intervention measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Rank Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic, multifaceted approach (Individual assessment)</td>
<td>1.5</td>
</tr>
<tr>
<td>Behavioural intervention measures (general education on fall risk, advice on footwear)</td>
<td>5.0</td>
</tr>
<tr>
<td>Intrinsic intervention measures (exercise interventions, nutritional supplements)</td>
<td>5.3</td>
</tr>
<tr>
<td>Extrinsic intervention measures (home assessment, equipment to reduce falls, house design, clothing to reduce fall injury)</td>
<td>5.5</td>
</tr>
</tbody>
</table>

The respondents added a number of other intervention measures to the list. These included: multifactorial/combination of all (x6); multidisciplinary assessment and involvement (x4); education and advice (x3); broad environmental and transport programmes to reduce falls and trips in the street in public buildings and using public and institutional transport; compliance with advice; eyesight; advice on coping strategies.

It can be seen that these data tend to reflect the mean rank score data for each risk factor, Table 6.12. The interventions with the higher mean rank scores have the higher percentages of high rank responses. The risk factors with the lower mean rank scores have the higher percentages of low rank responses.

The mean rank scores for all risk factors ranged between 1.5 and 7.0, Table 6.12. The best ways of preventing falls according to the mean ranks, are individual assessment, home assessment, exercise, equipment and education.
to older people. Clothing to reduce fall injury was not thought to play a significant role in preventing falls (or injuries to falls), scoring the lowest success rate. Nor were advice on footwear, nutritional supplements or house design thought to be particularly useful ways of preventing falls among older people.

When looking at the frequency of the responses for each rank and intervention (Figure 6.4) these initial data are reinforced. It is apparent that individual assessment is ranked as most important by 70% of respondents, followed by home assessment (19%), education to older people (11%), exercise (5%), and equipment (4%).

Figure 6.4 Frequency of responses (%) for rank and intervention method
6.3.5 Relationships between intervention measures and participant information

Significance tests were conducted in order to examine whether any relationships were present between the way in which the risk factors for falls were ranked and the job role of the respondents, time in job and the respondents' working environment. The Chi² test and the Mann-Whitney U-test were used to assess relationships and their significance. Significance was shown at a p value of 0.05 or less. Only the significant differences in ranking responses between intervention methods and participant factors have been detailed. (Any relationships between them that are not highlighted were not found to be significant.)

Distribution of ranks by job role

The categories of job role (as per Table 6.1) and the same methods of amalgamating high, low and medium rankings (Table 6.6) have been used to examine the relationships, which are summarised in Table 6.14.
Table 6.14 Intervention measures: mean of ranks by job role (with significant differences shown)

<table>
<thead>
<tr>
<th>Job Role</th>
<th>Mean Rank Score for Each Intervention Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual assessment</td>
</tr>
<tr>
<td>Health and social care management</td>
<td>1.8</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>1.6</td>
</tr>
<tr>
<td>Nurse</td>
<td>1.5</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>1.3</td>
</tr>
<tr>
<td>Home visitor/day care, e.g. social services, home carer</td>
<td>1.6</td>
</tr>
<tr>
<td>Medical physician</td>
<td>1.2</td>
</tr>
</tbody>
</table>

KEY: Significant differences are shown as: \([p<0.05] \), \([p<0.01] \), \([p<0.001] \).
**Distribution of ranks by working environment**

The categories used to examine whether any relationships were present between the way in which the causal factors for falls were ranked and the working environments of the respondents, were those detailed in Table 6.3. The ranks were again refined in order to complete the analysis, as previously, Table 6.6. The relationships are summarised in Table 6.15.

**Distribution of ranks by number of years in job**

The categories used to examine whether any relationships were present between the way in which the prevention measures for falls were ranked and the number of years experience in the job (and therefore, attitude and training), were those detailed in Table 6.4. The ranks for risk factors were also refined in order to complete the analysis, as previously, Table 6.6. The relationships are summarised in Table 6.16.
Table 6.15 Intervention measures: mean of ranks by working environment

<table>
<thead>
<tr>
<th>Working Environment</th>
<th>Mean Rank Score for Each Intervention Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual assessment</td>
</tr>
<tr>
<td>Ward based inpatients</td>
<td>1.7</td>
</tr>
<tr>
<td>Ward based outpatients, community hospital role</td>
<td>1.3</td>
</tr>
<tr>
<td>Day Centre, care homes, older people’s homes</td>
<td>1.4</td>
</tr>
<tr>
<td>Office based roles</td>
<td>2.0</td>
</tr>
</tbody>
</table>

No significant differences between data.
Table 6.16 Intervention measures: mean of ranks by time in job (with significant differences shown)

<table>
<thead>
<tr>
<th>Time in Job</th>
<th>Individual assessment</th>
<th>Home assessment</th>
<th>Exercise interventions</th>
<th>Equipment to reduce falls</th>
<th>General education on fall risk</th>
<th>Advice on footwear</th>
<th>Nutritional supplements</th>
<th>House design</th>
<th>Clothing to reduce fall injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>1.7</td>
<td>3.0</td>
<td>4.0</td>
<td>4.2</td>
<td>4.4</td>
<td>6.5</td>
<td>7.3</td>
<td>7.1</td>
<td>6.6</td>
</tr>
<tr>
<td>5-9 years</td>
<td>1.2</td>
<td>3.1</td>
<td>3.2</td>
<td>4.4</td>
<td>4.1</td>
<td>5.5</td>
<td>6.6</td>
<td>6.2</td>
<td>7.2</td>
</tr>
<tr>
<td>10-14 years</td>
<td>1.3</td>
<td>3.0</td>
<td>2.8</td>
<td>3.7</td>
<td>4.7</td>
<td>5.0</td>
<td>6.0</td>
<td>7.0</td>
<td>7.1</td>
</tr>
<tr>
<td>15+ years</td>
<td>1.3</td>
<td>3.6</td>
<td>4.2</td>
<td>4.0</td>
<td>3.7</td>
<td>5.4</td>
<td>6.3</td>
<td>7.0</td>
<td>7.3</td>
</tr>
</tbody>
</table>

**KEY:** Significant differences are shown as: $p<0.05$ $p<0.01$ $p<0.001$
Relationships between ranking of risk factors and intervention measures

There were no significant differences between the choice of risk factors and the choice of intervention measures. However, some patterns of similarity were apparent between some choices including generally low ranked risk factors being linked with low ranked intervention measures, and vice versa.

6.3.6 Problems in trying to reduce the occurrence of falls (Likert questions)

The respondents were asked to rank a number of issues that have been raised in the literature as problems in trying to reduce falls among older people. These issues have also been introduced as implicit in the earlier stages of this research (chapters 3, 4, 5, 6). The questionnaire covered 7 of these problem areas, being:

- Older people are set in their ways and won’t heed my advice
  ➢ Lack of compliance was an issue raised in chapters 2-6, with respect to carrying out changes to one’s behaviour and to the environment. It has also been discussed in the literature with respect to compliance of intervention groups in multifactorial fall interventions (Van Haastregt et al 2000) and with the use of hip protectors (Cameron et al 2000).

- Insufficient time or money is available to support my activities
  ➢ This was an issue implicit in the literature (Hughes 2002) and apparent as a difficulty when discussing falls with health professionals (Williamson 2001; Fife 2002).

- Lack of commitment from my colleagues/superiors
  ➢ It can be suggested by the tone of the literature (DoH 2002, DTI 2001) that there is little holistic working practice or team working between disciplines, which impacts on the efficiency of fall prevention (Hughes 2002). Fall prevention strategies are often given low priority relative to other organisational goals (Hughes 2002), possibly because they lack organisational support and commitment
- Insufficient/inadequate materials (e.g. leaflets) available to give to older people
  - There is little evidence of distributed materials in the published literature (Gillespie et al 2003), this suggestion is enforced by the reports from chapters 3 and 4 that only a very small proportion of older people have seen or received any materials regarding falls

- Falls occur largely by chance and are difficult to prevent
  - That falls are an inevitable part of aging was a viewpoint of some participants in earlier studies (chapters 3, 4). Doubts regarding the effectiveness of differing approaches has emerged as a reason for the absence of fall prevention strategies (Hughes 2002)

Respondents were asked to rate each issue (independently) according to their personal experience as a health professional. They were asked to rate each issue by circling the appropriate number on a scale that represented their opinion. A 7-point Likert scale was used, where 1 = (I have found this issue to be) No problem at all, 7 = (I have found this issue to be a) Significant problem.

This same scoring system has been used in Table 6.17. All of the issues scored a high rank (i.e. no problem with this issue in the course of my work) on at least one occasion. Equally, all issues were ranked as a significant problem on at least one occasion.
Table 6.17 Scores for barriers in trying to reduce falls among older people

<table>
<thead>
<tr>
<th>Issue</th>
<th>N of Unranked Responses</th>
<th>Highest Rank</th>
<th>Lowest Rank</th>
<th>Mean Rank</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of commitment from my colleagues</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>3.09</td>
<td>1.80</td>
</tr>
<tr>
<td>Falls occur largely by chance and are difficult to prevent</td>
<td>7</td>
<td>1</td>
<td>7</td>
<td>3.42</td>
<td>1.83</td>
</tr>
<tr>
<td>Lack of commitment from my superiors</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>3.47</td>
<td>2.09</td>
</tr>
<tr>
<td>Insufficient materials (e.g. leaflets) available to give to older people</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>3.54</td>
<td>1.74</td>
</tr>
<tr>
<td>Inadequate materials available to give to older people</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>3.97</td>
<td>1.75</td>
</tr>
<tr>
<td>Older people are set in their ways and won't heed my advice</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>4.12</td>
<td>1.59</td>
</tr>
<tr>
<td>Insufficient time or money is available to support my activities</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>5.69</td>
<td>1.63</td>
</tr>
</tbody>
</table>

When placed in overall rank order the mean rank score for each risk factor varied between 3.09 and 5.69, Table 6.17. The greater problems that need to be overcome, according to the mean rank scores, are insufficient time or money available to support activities, and older people being set in their ways and not heeding advice. It was felt by respondents that a lack of commitment from colleagues and superiors, and the fact (participants felt) that falls occur largely due to chance and are difficult to prevent, are the lesser problems faced when trying to reduce falls among older people.
Figure 6.5 shows the frequencies of answers for each Likert question. It can be seen that these data tend to reflect the mean rank score data for each issue, Table 6.18, as would be expected. The lower mean scores have higher percentages of positive (agreeable) responses. The higher mean scores have higher percentages of negative (disagreeable) responses. Table 6.19 is also useful to examine where the majority of the frequencies occur for each issue.

![Figure 6.5 Frequency of responses: problems faced when trying to reduce falls among older people](image-url)
### Table 6.18 Percentages of ratings for each issue in falls prevention

<table>
<thead>
<tr>
<th>Rating / %</th>
<th>Older people won't heed advice</th>
<th>Insufficient time/money available</th>
<th>Lack of commitment from colleagues</th>
<th>Lack of commitment from superiors</th>
<th>Insufficient materials</th>
<th>Inadequate materials</th>
<th>Falls occur by chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>7.1</td>
<td>2.6</td>
<td>23.0</td>
<td>21.4</td>
<td>15.8</td>
<td>9.7</td>
<td><strong>20.0</strong></td>
</tr>
<tr>
<td>Disagree</td>
<td>11.5</td>
<td>5.3</td>
<td>26.5</td>
<td>21.4</td>
<td>14.9</td>
<td>15.0</td>
<td>16.4</td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>13.3</td>
<td>4.4</td>
<td>9.7</td>
<td>13.4</td>
<td>18.4</td>
<td>14.2</td>
<td>15.5</td>
</tr>
<tr>
<td>Neutral</td>
<td><strong>23.9</strong></td>
<td>4.4</td>
<td>16.8</td>
<td>12.5</td>
<td><strong>20.2</strong></td>
<td>18.6</td>
<td>18.2</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td><strong>23.9</strong></td>
<td>19.3</td>
<td>10.6</td>
<td>8.0</td>
<td>17.5</td>
<td><strong>21.2</strong></td>
<td>17.3</td>
</tr>
<tr>
<td>Agree</td>
<td>15.9</td>
<td>19.3</td>
<td>9.7</td>
<td>9.8</td>
<td>7.0</td>
<td>14.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>4.4</td>
<td><strong>44.7</strong></td>
<td>3.5</td>
<td>13.4</td>
<td>6.1</td>
<td>7.1</td>
<td>7.3</td>
</tr>
</tbody>
</table>

*Most frequent rating for each issue is highlighted (more than one rating is highlighted for each issue when frequencies are equal)*

Respondents were also able to add any other issues that they felt were significant and give them a rating, by the use of 2 blank boxes below the Likert questions. Issues that arose that were strongly felt to be problems included: referrals too late, significant frailty; poor compliance with hip protectors; lack of resources; cognitive impairment (x4); ability to learn prevention strategies; a lack of knowledge in people addressing fall strategy and services; poor coordination (x2); a lack of holistic assessment; loss of confidence among fallers; increasing numbers of frail people at home; slow responses; falls being due to non-modifiable risk factors; primary care constraints; transport and administration problems e.g. to get patients to exercises or assessments; lack of expertise in professional dealing with this; having to be reactive, i.e. responding to referrals rather than proactive giving health promotion advice; lack of education - both staff and older people; lack of community services available to prevent falls; discrimination of elderly people, e.g. go to the back of the queue for MRI/CT scans etc.; fear of moving.
Issues that were considered to help to improve the problem included: seamless service delivery between organisations and areas; linking of current services trust wide and between agendas; being able to get to people when the need arises once the intervention has stopped i.e. continuing to maintain/do home exercises etc.; and, raising awareness levels amongst GPs.

These issues are discussed further under Qualitative Responses, 6.3.7.

Relationships between Likert ratings and participant information
Tables 6.19-6.21 break down the results into the professional groups, time in the job and work environment

It was felt by the majority of the professions that there was a lack of time and money to support fall intervention and research into the risk factors. It is interesting to note that the smallest percentage is for the management group.

It appears that physicians are least likely to find compliance a problem in falls prevention, particularly compared to home visitors who are most likely to perceive that older people are not heeding their advice. This may be due to home visitors consisting of a variety of individuals some who are less well trained than doctors, resulting in a less respectful relationship between them and the older people that they visit. It may also be due to the differing nature of the advice that is given by the professions. This result is clarified during examination of the work environments; almost 70% of the respondents who work in a community setting feel that older people being set in their ways and not heeding advice is a difficulty in falls prevention.

Having a lack of commitment from colleagues was generally not found to be too much of a problem, although was the most significantly reported amongst doctors. Having a lack of commitment from superiors was found to be more of a problem amongst the majority of professional groups.
Table 6.19 Issues in trying to reduce falls among older people: the distribution of ratings by job role (significant differences \( p<0.05 \))

<table>
<thead>
<tr>
<th>Profession / Issue (%)</th>
<th>Older people are set in their ways</th>
<th>Lack of time and money available</th>
<th>Lack of commitment from colleagues</th>
<th>Lack of commitment from superiors</th>
<th>Insufficient materials</th>
<th>Inadequate materials</th>
<th>Falls occur by chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and social care management</td>
<td>50 (%)</td>
<td>64</td>
<td>29</td>
<td>27</td>
<td>14</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>44 (%)</td>
<td>86</td>
<td>7</td>
<td>32</td>
<td>32</td>
<td>56</td>
<td>26</td>
</tr>
<tr>
<td>Nurse</td>
<td>47 (%)</td>
<td>84</td>
<td>17</td>
<td>24</td>
<td>37</td>
<td>53</td>
<td>63</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>50 (%)</td>
<td>91</td>
<td>27</td>
<td>32</td>
<td>27</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Home visitor/day care, e.g. social services, home carer</td>
<td>75 (%)</td>
<td>75</td>
<td>25</td>
<td>13</td>
<td>50</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Medical physician</td>
<td>23 (%)</td>
<td>86</td>
<td>46</td>
<td>46</td>
<td>32</td>
<td>46</td>
<td>19</td>
</tr>
</tbody>
</table>

Insufficient materials were deemed to be a problem by approximately one third of respondents across the varying professions. Respondents from management did not find it as much of a problem as the professions dealing more personally with older people. Half of responses from the home visitor category reported that insufficient materials were a problem in their job. However, according to the responses regarding adequacy of materials available, half of the OTs, nurses, physicians and approximately one third of each of the other groups of professionals felt strongly that fall prevention materials available for older people were inadequate.

There was a range of responses across the professions as to whether falls occurring by chance was a problem in falls prevention. The nurses felt most
strongly about this, and the physiotherapists the least strongly. However, there was a varied response across experience and working environment.

Table 6.20 Percentage of individuals from each working environment who feel that the issue is a problem in the prevention of falls among older people.

<table>
<thead>
<tr>
<th>Working Environment / Issue (%)</th>
<th>Older people are set in their ways</th>
<th>Lack of time and money available</th>
<th>Lack of commitment from colleagues</th>
<th>Lack of commitment from superiors</th>
<th>Insufficient materials</th>
<th>Inadequate materials</th>
<th>Falls occur by chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward based (inpatients only)</td>
<td>36</td>
<td>91</td>
<td>28</td>
<td>35</td>
<td>41</td>
<td>50</td>
<td>34</td>
</tr>
<tr>
<td>Ward based (outpatients), falls clinic, community hospital</td>
<td>43</td>
<td>88</td>
<td>23</td>
<td>38</td>
<td>31</td>
<td>44</td>
<td>28</td>
</tr>
<tr>
<td>Day centre, care homes, visit older people at home</td>
<td>69</td>
<td>63</td>
<td>31</td>
<td>19</td>
<td>19</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>Office based role</td>
<td>43</td>
<td>57</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>29</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 6.21 Percentage of individuals who had worked in the job for varying times who feel that the issue is a problem in the prevention of falls among older people.

<table>
<thead>
<tr>
<th>Time in Job / Issue (%)</th>
<th>Older people are set in their ways</th>
<th>Lack of time and money available</th>
<th>Lack of commitment from colleagues</th>
<th>Lack of commitment from superiors</th>
<th>Insufficient materials</th>
<th>Inadequate materials</th>
<th>Falls occur by chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 years</td>
<td>43</td>
<td>79</td>
<td>14</td>
<td>14</td>
<td>29</td>
<td>41</td>
<td>27</td>
</tr>
<tr>
<td>5-9 years</td>
<td>39</td>
<td>85</td>
<td>31</td>
<td>35</td>
<td>35</td>
<td>44</td>
<td>27</td>
</tr>
<tr>
<td>10-14 years</td>
<td>33</td>
<td>80</td>
<td>40</td>
<td>60</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>15+ years</td>
<td>56</td>
<td>88</td>
<td>27</td>
<td>44</td>
<td>29</td>
<td>44</td>
<td>39</td>
</tr>
</tbody>
</table>

Relationships between Likert ratings and ranking of risk factors/intervention measures

As may be expected, positive relationships were found between the majority rated Likert issues and the majority ranked risk factors/intervention measures.

6.3.7 Qualitative Responses

Individuals were asked in an open response question to add any other comments they may have about their previous responses regarding falls among older people, prevention and cause. It was anticipated that some of the questions would be provocative and raise comment amongst respondents. This certainly seemed to be the case, with the majority of the returned questionnaires capturing open response accounts. This qualitative data has been considered under themed topics below.
Older People & Compliance Issues

Several comments were made about patient compliance issues. General compliance during or after an intervention measure was raised several times as being a problem, reinforcing the response of the similar Likert question.

The older the wiser

It was felt that compliance is a big problem among older people “as they are often so set in their ways” and “they’re not so keen to take advice from ‘youngsters’”. It had been found that when given advice to prevent falls, older people had often ignored it as they felt they “have a lot more life experience”. Medication compliance was a particular issue raised in this respect.

Once non-compliance starts (or the direct intervention has stopped), it was perceived that patients often slip back into their old ways and quickly revert back to their pre-intervention condition, e.g. lose confidence again. It was predicted that this decline might result in a spiralling social isolation.

There was discussion, to some extent, about the low levels of risk perception that persist amongst older people until a fall occurs.

Even when an older person has sustained a fall, it is often difficult to persuade the individual to adhere to recommendations as they feel that they are unrelated to the causes of the initial fall event:

“In my work I frequently find that risks identified in home assessment (e.g. rugs, trailing wires, unsafe activities) which were not the cause of the person’s fall (i.e. fell in some other circumstances/environment) can make it very difficult to persuade the older person to make changes in their home environment and/or lifestyle, as they do not relate the risk to having another fall.”

No one wants to feel old

Even if a recommendation relates to a risk factor that caused an individual to fall previously, compliance can still be problematic. It was felt that much of
the difficulty in encouraging older people to change their lives and homes is related to the resistance felt to getting older and the problems which come with ageing. It is also related to lifelong habits and activities, which become difficult to change with age. No one wants to accept that they are unable to do things because they are “getting old”.

“Home visits can be a problem – we are only allowed to recommend alterations in someone’s home – often if rugs were removed or inadequate chairs made higher, once we’ve gone people change everything back to how it was.”

The same theme of not wanting to ‘become old’ was raised as an issue in attendance at falls clinics. It was also felt that many older people do not perceive themselves as ‘old’.

“People are reluctant, in my experience, to attend falls clinics after a first fall that has resulted in only minor injury, often saying, “it’s my age”...This is despite saying that the clinic is for people of their age group.”

However, this was contrasted with the idea that older people tend to accept falls as the norm, unless they have injuries, as they see this as an inevitable part of getting older. It was raised by one respondent that such acceptance and forceful independence can result in older individuals becoming housebound:

“Older people’s perceptions of their own abilities can easily make them become housebound...they just cope rather than seek advice from their GP...”

“I find that the older generation are very reluctant to ask for help. They feel that they are being too much trouble and try to carry on without making a fuss.”
Varying success of intervention strategies

There was some feedback on success of compliance of prevention strategies. It was felt that supervised exercise had a higher compliance than environmental advice (e.g. clutter, remove rugs etc.). It was felt that hip protectors were disliked amongst older people and as a result are very poorly complied with.

"Older people who are no longer able to use stairs don't always have facilities to live on one floor and are expected to use other equipment, commodes etc., which often reduce their dignity. There is often a long waiting list for stair lifts etc."

Cost to older people

Finally, it was emphasized that if adaptations incur a cost to the patient and/or the family and they are not in a financially viable situation, this can result in non-compliance.

"Older people often cannot afford to replace items that put them at risk of falling — carpet etc."

Fall Screening Tools

It was deemed that attention needs to be given toward falls screening, risk assessment tools and pathways. It was generally felt that a homogeneous way forward across the country is required with respect to standardization of screening tools, pathway and interventions, using evidence-based practice. It was clearly felt that support for older people in their own homes by home care services and support networks, is essential to allow rehabilitation to take place safely and effectively.

It was also felt that the overall design and use of fall prevention care plans need to be improved upon, and that clarification and reinforcement of the legal position of professionals and organizations is required.
Staffing - Arrangements & Costs

Time and resources

Many comments were made regarding staffing time arrangements and staffing related costs. These remarks made particular reference to the costs of implementing the objectives of the NSFOP and discrepancies regarding commitment and funding from the various primary care trusts:

"The milestones of the NSF are very commendable and I totally agree with them. However, to implement them takes time and resources, which have not been made available. In our service we have reorganized the day hospital to start a multidisciplinary fall reduction program but we are behind with audit and research because we do not have the time and training to do it."

"There is lots of very valuable work being done in this area but there is a lack of commitment/funding from PCTs which is hindering this."

Multidisciplinarity and joined up working

The majority of the qualitative responses covered the topic of multidisciplinarity and joined up working, with strong emphasis on the importance of linking targets across localities and disciplines.

"We need to ensure joined up working amongst all agencies."

Many respondents were convinced that attention needs to be given toward the involvement of other professions allied to medicine e.g. podiatrists, dieticians, ophthalmologists etc. However, it was also added that it was paramount that older people knew about the services available and that they could use them, e.g. opticians' home visits. It was also felt that wherever appropriate, consideration needs to be targeted toward involving non-professionals in assessment, prevention, treatment and rehabilitation.
“The most effective way to reduce falls amongst older people is a multidisciplinary approach across all agencies that deal with the patient. We should not underestimate the impact that can be made via community staff in social services.”

It was highlighted that although there is a great amount of useful work going on among many small groups, there is a lack of dissemination and team working across areas (and often disciplines too)

“…a lot of initiatives are being actioned and a lot of individual organisations are ‘doing their bit’, but the spreading and sharing of information is poor and the coordination in any area is impossible unless there are designated people responsible for this.”

Networks to share ideas and pilot studies to avoid ‘reinventing the wheel’ such as coordinated work on risk assessment tools, and trialling the use of hip protectors, were deemed appropriate methods of dissemination.

There was general agreement that there has to be commitment from a multidisciplinary team and the post in order to coordinate such propagation as well as organizing full holistic assessments, with health promotion and risk management programs.

**Gaps within the falls care pathway**

Gaps within the falls pathway were commented upon. These included various remarks about older people not reporting the falls they have sustained to their General Practitioner or Practice Nurse. This again, relates back to compliance and the effect the (non-injurious) fall has had on the individual concerned. There may also be issues here regarding the training of GPs. It was felt that there was a lack of accurate local statistics on falls from GPs, hospitals, and the Ambulance Service.

“The GP is not always told of falls.”
It was observed that very rarely is anything done with details gathered by the Ambulance Service on "back to bed fallers". It was felt that this is another area where there is a 'missing link' and development of the Ambulance Service into the system would be very worthwhile in falls prevention.

"Linking across all pertinent agencies and activities is difficult to coordinate and develop, due to work pressures, time constraints and lack of resources."

Organizational arrangements
The valuable role of fall prevention coordinators was acknowledged. However, it was felt that attention needs to be given toward the part time nature of many fall prevention coordinators' roles, their short term contracts and the fact that, generally, funds are constantly having to be found for such 'preventative' roles.

Politics
There was a small mention of workplace politics making joined-up working difficult. There was also discussion about the organisation of referrals and queuing systems that are necessary for treating older people who have fallen or who are at risk of falling:

"Therapists have initiatives, plans etc. but seem to be frustrated most by lack of funding and politics between managers (nurses, therapists)."

"Older people get sent to the back of the queue for CT/MRI scans etc. – GPs can now ask for a CT scan but still need a consultant for an MRI scan."

Falls within hospital: equipment and organisation
It was felt by a small proportion of respondents that patients continue to fall in hospital for a number of key reasons. Issues reported included: lack of insight of staff, health problems (e.g. blood pressure), lack of care by older people about how they move about and what they attempt to do, and poorly designed wards (as staff cannot be as vigilant as they may wish to be due to poor
visibility of all the beds from the nursing station) and equipment (walking aids, bed rails etc.). It was also felt that reduced staffing levels cause inadequate supervision levels for patients in acute settings, which combined with poorly designed wards, contribute to falls in the ward environment. The problem of identifying falls in hospital was also raised, due to the organisational structure. For example, if older people are split up into varying different wards (as is the case in many local hospitals - older people can be in one of 4 wards) then it is difficult to "keep tabs" on them and to feed on information to the appropriate members of staff.

Money (and resources)

One of the key messages from all of the qualitative comments, emphasized by many respondents was that unless money is released to develop better preventative measures a reduction in falls among older people cannot be achieved.

"...you get tired of pushing uphill all the time to get money"

Risk Factors

'Falls occur largely by chance' was judged to be dependent on how a person has described their incident. The causes are complex and not necessarily due to the same factor. It was felt that many of the causes of falls have equal levels of risk due to the feeling that "our patients seem to meet all criteria for high risk".

Polypharmacy

Polypharmacy was discussed on three occasions as being a well recognised risk factor for falls among older people. The point was made that although this is a know fact, more and more drugs are being recommended, e.g. for prevention of strokes and myocardial infarction. A further reference was also made to the fact that the National Service Framework for Cardiology (DoH 2001) promotes the "dreaded polypharmacy", which is "counter productive" in fall prevention.
Cognitive impairment

A specific group of older people that were recognized to be at a particular risk of falling were the cognitively impaired, particularly those who are mobile.

"People with dementia are individuals at risk and are seriously vulnerable."

"Dementia is often a problem as people may forget they fall when carrying out certain risky activities."

Psychosocial factors

It was considered by some respondents that all health professionals need to agree that psychological factors are important to consider in fall risk. For example, fear of falling, was described by one respondent as “often being increased by well meaning relatives”. One option to overcome this may be to educate both the patient and their relatives, “especially those who undermine fragile confidence by such comments as “sit down Mother, you’ll fall””.

It was suspected that confidence building and reassurance are especially important after a near miss or the first fall; it was believed that confidence can disappear very quickly and can be difficult to retrieve. It was felt that once an older person has fallen or had previous falls they need to be at least given advice from their GP/A&E to seek help or advice to prevent further falls from happening and to attempt to regain confidence. However, it was reported that this doesn’t often happen.

Interventions

It was felt that the area of falls is a well-researched subject offering adequate information on fall prevention strategies, which should assist a reduction in falls.

Hip protectors

There were various comments made regarding hip protectors, although they were generally well accepted. It was felt that hip protectors are often not appropriate for older people unless they are in institutional care, as
compliance was felt to be too big an issue in the community for such products to work properly. It was considered that hip protectors should be available on prescription.

**Education**

Education was deemed to be a useful method of reducing falls and raising awareness among older people. It was felt strongly that publicity and education by members of the peer group were more likely to be accepted by older people. It was commented that such a forum could also act as a support network. It was noted that a successful method of education was the presentation of information about where falls occur and real life injuries that result:

"I find that the clients become empowered to make the right decisions for themselves, helping to prevent falls."

"They need a follow up support network, perhaps peer organised."

As well as general education on fall risk, it was felt that older people need education on how to cope after a fall. Another interesting point that was raised was that families giving support at home are often not aware of the support services that are available or from where they can seek help to prevent falls. It was emphasized that this is a group of people that it would be useful to educate.

A final group that respondents thought could be targeted were GPs, and health professionals working in A&E:

"We need more awareness in general practice and A&E departments about the patients at risk of falling to target interventions at these patients."

**Exercise**
It was felt that a lot of interventions have a hospital and medical basis. It was considered that community based interventions were even more important. For example, exercise was discussed as an important intervention measure, although difficulties were reported with finding appropriate classes to refer older people to:

"We need to try and provide places for older people to exercise (lifelong) safely and independently out in the community. At present there is nowhere to pass these patients on to after acute and sub acute management."

**Best practice**

It was recognized that it is not always possible to prevent falls from happening, despite absolute best practice regarding intervention strategies. However, an important point to be raised was the fact that health professionals can help patients in terms of independence, confidence, and knowledge, e.g. give patients the ability to get up from floor after a fall

### 6.4 Discussion

#### 6.4.1 Key findings

The overall opinions from this study support those from the thesis' previous investigations in indicating that fall risk is multifactorial and interventions need to be holistic, multidisciplinary and joined up.

**Risk factors for falls**

*Summary and discussion of findings*

In the opinion of the respondents, the main risk factor in falls are a combination effect of many risk factors, followed by frailty, effect(s) of medication, trip and slip hazards, and risky behaviour. Alcohol consumption was not thought to play a significant role in falls, scoring the lowest importance. Nor were low lighting levels, poor nutrition and footwear thought to be significant risk factors in falls among older people.
The distribution of ranks by job role and work environment elicited some variation in response. Frailty was generally ranked as an important risk factor across all disciplines. However, the significant differences in ranking found between OTs and other professionals may be due to the fact that OTs have a more rounded approach and tend to spend more of their job in the community. According to the data in Table 6.3, the proportion of OTs working in the community was higher than average across the rest of the professions. Therefore, OTs may feel that it's not just frailty that affects fall risk, and that other factors play a key role, including lack of awareness, light levels, slip and trip hazards, and footwear, ranking frailty as less important accordingly. However, there was no significant difference overall for ranking of frailty and reported working environment.

The side effects of medications and the results of polypharmacy were also felt to be highly implicated in falls risk. There were some differences in response between home visitors, doctors and nurses, which may be due to a less ‘medical’ approach by the home visitors. The effect of medications was the only risk factor to have a consequential difference according to time in the job. The longer respondents had been in the job, the more they felt that polypharmacy played a significant role in fall risk. Alcohol consumption, poor nutrition, and vision were ranked of little consequence in falls risk by all respondents. This reflects the feelings in the literature, although these factors have been studied in the literature but not to the same extent as the other factors in this list. However, there were some differences in ranking according to different workplaces. Professionals working in a community hospital/outpatient role ranked alcohol consumption more highly than professionals working in a ward based environment. However, professionals working in a community hospital/outpatient role ranked alcohol consumption more highly than home visitors. It may be that individuals form this sample working in the community have some experience of alcohol issues but think it's more of a problem than it really is, as seen by home visitors. Alternatively, home visitors may not see any alcohol related (hidden) problems. Another
Risk behaviour was ranked differently according to profession. OTs, nurses, home visitors, and doctors all ranked risk behaviour more highly than health and social care managers. This may be due to managers being a little removed from realism and what older people are actually doing, due to the limited amount of contact they have with them, compared to the other professions. Home visitors also ranked risk behaviour more highly than physiotherapists, which may again be due to the environment in which they are working in. This can be backed up by the fact that home visitors ranked risk behaviour more highly than professionals working in a ward based environment, which may be due to home visitors seeing how older people really do behave in their homes, as they regularly attend as part of their job.

The role of a lack of awareness in falls was rated more highly by OTs than by physiotherapists. The OTs in this sample were more likely to be working in the community than the physiotherapists, although there were no significant difference between the two groups. Therefore, this may be due to differences in past experiences and the type of training received by the different groups. Nurses ranked lack of awareness more highly than health and social care managers. This may be due to managers having less face-to-face contact with older people and therefore having less of a feel for what older people are actually doing.

OTs and home visitors ranked low lighting levels as a risk factor in falls, more highly than physiotherapists, which may again be due to the environment in which they are working, as both groups are in older people's homes more than the physiotherapists in the sample. This is concurrent with the fact that professional working in a community hospital/outpatient role ranked low lighting levels more highly than professionals working in a ward based environment.
Physiotherapists and doctors both ranked slip and trip hazards significantly less highly than occupational therapists. Footwear as a risk factor was ranked less highly by physiotherapists and doctors than by nurses and home visitors and OTs ranked footwear more highly than physiotherapists. All of these differences may be down to education and training. Working environment may play a role in rank of footwear as respondents working in community/outpatient roles ranked footwear more highly than professionals in a ward based role. However, trip and slip hazards held similarly ranked positions across individuals from all working environments.

The members of all professions ranked combination effects highly, although physiotherapists ranked it significantly more highly than home visitors. This may be due to differences in education and training. Combination effects were ranked similarly highly amongst all professionals, independent of their working environment.

Comparison to the perceptions in the literature
As discussed in chapter 2, of all the risk factors for falls, the most importance has been placed on a combination of all risk factors, followed by intrinsic risk factors. The next most emphasis has been placed on extrinsic risk factors. However, behaviour has appeared rarely as an issue for falls among older people (Lord et al 2001; Gillespie et al 2003).

Conversely, the perceptions based on the experience of the respondents in this survey demonstrate that behavioural risk factors are felt to be far higher on the agenda. After the combination of risk factors, the behavioural risk factors (risky behaviour and a lack of awareness) have been placed as the next most significant. The overall mean rank for all of the intrinsic risk factors is third most important, and the overall mean rank for all of the extrinsic risk factors is the least important, signifying that these categories are perceived as the least most important risk factors for falls.
Comparison to the perceptions in the thesis to date

The risk factors for falls described as important and influential by this professional cohort, are aligned with the findings in the earlier chapters of this thesis. A combination of multifactorial risk factors (discussed in chapters 3-5 and summarised in figures 5.12, 5.14) is a central and evident danger to postural stability, and behavioural factors contribute significantly to this.

Intervention measures for falls

Summary and discussion of findings

According to the experiences of the respondents, the most successful intervention measure for preventing falls is an individual assessment, followed by home assessment, exercise interventions, equipment to reduce falls and general education to older people about fall risk. Clothing to reduce falls was not thought to be a beneficial intervention, scoring the lowest importance. House design, nutritional supplements and advice on footwear were also not thought to be significantly beneficial interventions in preventing falls among older people.

There were no differences between ranking preferences and respondents' work environments for any of the intervention methods. However, there were differences in the distribution of ranks by job role. Physiotherapists and doctors ranked exercise more highly than nurses. Physiotherapists also ranked exercise more highly than home visitors, although was independent of time in role. This may be due to physiotherapists and doctors having read more from the literature about the benefits of exercise, as well as being educated towards this bias.

Individual assessment and home assessment were ranked similarly highly amongst all professions and were independent of experience. Nutritional supplements held similarly low ranked positions across all professions. However, individuals working in their present role for between 10 and 14 years and individuals working in their current role for 15 years or more ranked nutritional supplements as a method to prevent falls more highly than
individuals who had less than 5 years experience in their role. This may be due to differences in education and training, and on the job experience. However, it is a strange result as nutritional supplements were generally ranked as one of the least successful interventions measures. It could be due to outliers.

Home visitors ranked education less highly than nurses. This could possibly be due to home visitors having a better understanding of how older people are behaving in their homes. None of the nurses questioned reported to work in the home environment, whereas home visitors had the largest proportion of respondents working in the home environment. Therefore, it may be that home visitors are aware of what is going on in the home and feel that education doesn't work in falls prevention. Alternatively, they may feel that they have less authority over older people (and their consequent behaviour after education) and so rank it as a less useful method of falls prevention. This may actually be the case, and the resulting lack of change in behaviour may be the reason for their more negative ranking. The latter could be strongly implied as when asked, 75% of these professionals felt that older people being set in their ways and not heeding advice was a problem in reducing numbers of falls.

OTs and physiotherapists ranked equipment to reduce falls more highly than doctors. This may certainly be due to differences in education and training, and work environment. These significant differences in ranking found between doctors and the other professionals may be due to the fact that doctors spend less of their time in the community, and have less idea of how equipment is used in the real environment. According to the data in Table 6.3a, the proportion of doctors working in the community was lower than for OTs and physiotherapists (although the differences were not significant).

The OTs amongst the respondents had the highest proportion of individuals working in the community and older people's own homes within their group. This could play a role in the experiences and therefore the responses to the
ranking of clothing to reduce fall injury, and modifications to house design. Doctors ranked clothing to reduce fall injury more highly than OTs. This could be because OTs have seen in practice (in the community) the non-compliance issues with the use of such clothing, e.g. hip protectors, whereas doctor's simply prescribe them.

Modifications to house design were ranked more highly by OTs than by physiotherapists or doctors. This may be due to differences in training and experience, as well as working environment, as the OTs in the sample are out in the community and may see the issues more practically.

Advice on footwear was ranked similarly lowly amongst all professions. However, health professionals working in their current role for less than 5 years ranked advice on footwear significantly less highly than individuals who had been in their current role between 5 and 9 years. This may just be due to preferences amongst the sample.

**Comparison to the perceptions in the literature**

As discussed in chapter 2, of all the intervention measures for falls, the most importance has been placed on a holistic individual assessment that covers all aspects of fall risk (Feder et al 2000; AGS 2001; Lamb 2001; Scott et al 2001; Gillespie et al 2003). Exercise modification and other intrinsic interventions have also been highly regarded and greatly researched (Skelton et al 1999). Some work, and therefore, some emphasis, has been placed on extrinsic intervention measures such as home assessments and equipment (Gillespie et al 2003) and clothing to reduce falls (Cameron et al 2000). However, behaviour changes have seldom appeared as a possibility in fall prevention activities described in the literature.

On the contrary, the perceptions based on the experience of the respondents in this survey demonstrate that behavioural intervention measures are again, as for behavioural risk factors, far higher on the agenda. After the combination of risk factors, the behavioural intervention measures (advice,
education etc.) have been placed as most significant. The overall mean rank for all of the intrinsic intervention measures is third most important, and the overall mean rank for all of the extrinsic intervention measures is the least important, signifying that these categories are perceived as the least most successful intervention measures for falls and injuries from falls among older people.

Comparison to the perceptions in the thesis to date

It is strongly suggested in thesis chapters 3-5 that behaviour often plays a key role in fall risk. Although the investigation of behaviour as an intervention measure was out of the remit of this doctoral research, because of the evident link to behaviour as a risk factor in this thesis, it can be suggested that behavioural interventions may be beneficial in reducing falls, particularly if combined with other approaches. Additionally, comments were gathered from the older people participating in the studies reported in chapters 3-5, that information and advice from health professionals, relatives and friends can influence behaviour (3.5.3; 4.4.9).

These conclusions are in proportion to the findings from the cohort of health professionals who reported that behavioural intervention measures are an important issue in the reduction of falls among older people.

Problems in reducing falls among older people

Summary and discussion of findings

It was reported that some of the greatest problems that need to be overcome are insufficient time and money being available to support activities. The majority of the professions agreed with this and felt that more money should be available to support fall intervention and research, particularly with respect to the NSFOP.

Older people being set in their ways and not heeding advice was also reported to be highly problematic, particularly by home visitors who were the
respondents most likely to perceive that older people are not heeding their advice. Many issues were raised including discussion of the varying success of intervention measures according to older people themselves.

Insufficient materials were deemed to be a problem by approximately one third of respondents across the varying professions. Respondents from management did not find it as much as a problem as the professions dealing more personally with older people. Half of responses from the home visitor category reported that insufficient materials were a problem in their job. These differences may demonstrate that material is available within the hospital environment but supply is not continued amongst the more community-based professionals. This requires further investigation as important opportunities for passing on materials to older people may be being missed. However, according to the responses regarding adequacy of materials available, half of the OTs, nurses, physicians and approximately one third of each of the other groups of professionals felt strongly that fall prevention materials available for older people were inadequate. Therefore, further work is also required to investigate more suitable styles of fall prevention material.

It was felt that improvements are required with falls screening tools, as well as multidisciplinary, multi-agency working practices.

*Comparison to the perceptions in the literature*

The only specific listed problems that have been detailed in the literature with regard to falls prevention, have included issues of compliance and adherence (Cameron et al 2000; Lord et al 2001; Gillespie et al 2003). However, the literature has generally been very positive with respect to falls, with very few papers acknowledging that there are any fundamental flaws in the design of any falls pathways or practices. The fact that the majority of the literature on the topic is authored by leading physicians in the falls arena or by leading falls researchers may be a primary issue (Hughes 2002). For example, within a research unit that has successfully bid for funding, it is unlikely that there will be any problems regarding finances or suitably trained personnel for a falls
study, as successful funding will undoubtedly mean successful financial planning. It is also likely that these individuals will have multidisciplinary, multiagency working practices already in place, which have been described as in need of improvement by the respondents of these data.

It is interesting that (type, adequacy, and suitability of) education has been broached as a key area for progression. As well as practically ignoring all aspects of behavioural change via education, the literature scarcely mentions the types of education that are available. This again could be due to the nature of the authors of the majority of the published literature; the majority of the authors will have become “blinkereds” authorities in their specialist areas, making it difficult for them to take a homogenous view to all implications in falls among older people.

6.4.2 Limitations of the data

Nature of the sample
The response rate for questionnaire completion was very low (average 23%), despite the fact that distribution of the questionnaire was at prominent UK conferences on fall prevention. This was disappointing and possibly suggests an element of apathy or disinterest amongst fall prevention professionals. There are implications for the data set and it could be suggested that the data are skewed towards individuals who have particular problems and wish to share their frustrations. Alternatively, the data could be biased towards those individuals who are particularly interested in falls and take the time to respond.

There was variety in type of respondents, according to job role, time in job, and working environment, which provided a wealth of data. However, according to the fact that these people actually completed the questionnaire, they probably have a particular interest in the area of falls and hold a particular viewpoint. If the respondents are keen, they may have read up on the literature more than other health professionals (who are also working in the area but not interested enough to complete a questionnaire). This may
have resulted in them responding to the questions in a less valid manner, as they are answering according to the reports in the literature.

However, these issues are always problems with questionnaire surveys and other data gathering tools, such as interviews and focus groups. The most interested parties will take the time to respond and take part, and they may be extra-educated in the area of the questioning.

**Validity of responses**

It is impossible to tell from this data whether they really are a true reflection of the experiences of the population, or whether they are just a summary of the views in the literature. Due to the spread of responses, it does seem to suggest that they could be valid. For example, all of the risk factors for falls (except one) and all of the interventions (except one), were attributed a top rank score on at least one occasion. Equally, all risk factors (except one) were attributed a rank score outside the top ten for importance on at least one occasion and all intervention measures were ranked outside the top five for most beneficial intervention on at least one occasion. This suggests that respondents have taken some time to think about what they feel have been problematic and beneficial in their past experiences, as although the mean responses suggest a pattern of ranking similar to the literature, there is a significant spread of ranks for each factor presented.

Overall, it does not matter whether respondents are ranking the issues based on their personal experiences of patients or due to information from the literature, as long as the responses are representative of their opinions. More important is the reflection of how the individual professionals concerned react to falls amongst the older population, as it is to a large extent their opinions which form the method of treatment, e.g. how they investigate, prescribe, and educate older fallers. How the individual respondents have critiqued the risk factors and intervention measures is unknown to come up with a rank is unknown and it would be interesting to develop this further.
Missing data

There were numerous occasions where a respondent didn't attribute a rank to a particular risk factor or method of intervention. It could be assumed that if a score for a risk factor/intervention measure is missing, (unless an error has been made in completing the questionnaire – see Questionnaire design) the respondent has not felt that the factor is important enough to warrant a rank (i.e. is off the higher end of the scale in ‘unimportant-ness’). Tables 6.5 and 6.13 summarise the missing ranks across risk factors and methods of intervention.

For choices of risk factors, those with the most number of missing ranks tended to be the risk factors with the lowest mean ranks, as may be expected, apart from the combination of risk factors option. Strangely, the combination category had the highest frequency of missing ranks, which also scored the most highly for the mean rank and the frequency of rank ‘1’ scores. This may be due to the design of the questions – see Questionnaire design. It may also be that some respondents felt that it was too obvious a choice as it is regularly published that falls are multifactorial in their cause.

Again, as may be expected, the falls intervention methods with the most number of missing ranks tend to be the interventions with the lowest mean ranks, e.g. clothing to reduce falls, house design, and advice on footwear. The only exception to this is the intervention of nutritional supplements, which scored a low overall mean ranking, but had relatively few missing data. This may be because respondents were very sure that this intervention was not one that they had found useful in falls prevention (which is what has also been found in the literature).

Questionnaire design

There was a long list of factors to make decisions for the first two sections of the questionnaire. According to experts in the area, respondents should not be asked to rank more than 6 items at one time, because it is difficult and can affect validity (Sinclair 1995). However, the number of items on the longest list (risk factors) was 11, which is just over the recommended amount. Due to
the nature of the topics, it was felt that the list needed to contain all of these items for comparison purposes. It is clear to a person that works in the field, and in this case, the stakeholders, that several of the items are clearly towards the bottom or the top of the list, depending on the type of training they have received. Therefore, the number of large choices that respondents have to make is reduced. However, there was one comment from a respondent who actually wrote on his questionnaire that it required “a good deal of thought” to answer the questions. If the questionnaire was difficult to complete due to the nature of the choices that had to be made, how valid is the data if people didn’t want to take the time to really think about the rank order?

From the numbers of missing data, particularly on the first set of questions (risk factors), it could be that respondents missed off the last line of the question (which was ‘combination of many risk factors), due to the length. However, this could have been due to an assumption of importance for the combination effect or that respondents had had enough of the particular questions and wanted to move, or they had already ranked the rest of the items and missed it off by accident but didn’t want to bother repeating the exercise to include the last item.

The questionnaire was kept short in order to maximise response, which was another reason for having each of the first two sections laid out as they were in one long line. If the questionnaire was longer, and the single lines had been split up, into intrinsic, extrinsic and behavioural risk factors, for example, then the response rate may have been improved due to greater simplicity of questioning. However, the increased length may have had a detrimental effect on the response rate due to the perceived increase in number of questions.
6.5 Recommendations for possible improvement in the current falls pathway

The following tentative recommendations for an improved falls prevention pathway have been written after reviewing the main themes that have emerged from the questionnaire responses. Recommendations have been divided into categories of groups to be targeted. The recommendations have not been detailed as to specific actions that can be taken to fulfil them, they are solely indicators that each issue is perceived to be impacting detrimentally on fall risk and fall prevention.

6.5.1 Issues for health professionals with respect to management

The financial situation
- Make sufficient funds available to support initiatives and new resources, e.g. falls prevention coordinator roles

The understanding of falls
- Improved knowledge and understanding of falls epidemic (at all levels but especially for GPs, staff in A&E departments, and senior management)
- Improved feedback and dissemination (e.g. networks and pilot studies) is required (at all levels)

Cross-disciplinary working
- A holistic, joined up approach is required (at all levels)
  ➢ Links to the ambulance service and GPs (to ensure that all falls are reported)
  ➢ Link to other professions allied to medicine
  ➢ Links to complementary therapies
- Improved expertise with respect to team building and functioning
- Better coordination across all disciplines including the support networks, e.g. transportation, administration
- A reduced political agenda, e.g. queuing systems, inter-therapy communications/working, referrals

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6.5.2 Issues for health professionals with respect to older people

Health promotion and education
- This is required for older people and carers of older people. This should be particularly targeted towards increasing the understanding of fall risk. Increased understanding should lead to:
  - Increased perception of risk
  - Increased compliance and adherence to intervention strategies
  - Reduced fall risk
- Improved education should be made available regarding simple techniques that older people can use to improve quality of life if experiencing falls, e.g. get up from floor after a fall
- Improved education of existing assistance from health professionals, social services etc. with respect to falls, needs to be available to older people and their carers
- Throughout, all education needs to be positive rather than negative to make older people realise that falls are not an inevitable part of aging

6.6 Recommendations for further research

Several indicators have been raised by this exercise with respect to increasing the knowledge base of the following areas:

6.6.1 The approaches to fall prevention and screening

It was felt that a standardised process for screening tools and interventions, UK-wide, would be useful. However, it was considered that aspects of the overall design need to be improved upon, which need to be joined up and multidisciplinary.

Therefore, further investigation is required regarding:
  - The design and use of care prevention plans
  - How best a multidisciplinary falls prevention team works together (a systems approach)
The best way of capturing all relevant falls data on a population, to ensure that the current "missing links" within the falls pathway are surmounted.

6.6.2 The lack of compliance of fall prevention measures by older people at risk of falling

Non-compliant interventions that were raised included: choice and prescription of medication; use of hip protectors; adherence to environmental changes; adoption of suggested activities, e.g. positive health behaviour.

Further investigation is required regarding.

» The reasons for non-compliance
» The types of education/health promotion that can increase levels of compliance

6.6.3 The suitability of the different types of educational materials on the perception of fall risk

Various types of materials are available to educate older people (and their carers) about fall risk. However, it was described by the health professionals in these findings that materials could be more adequate and more appropriate.

Little has been done to investigate educational approaches to falls (lit review) and these qualitative findings emphasise this missing information.

Further information is required regarding:

» The suitability of educational materials
» The impact of these materials on perception of fall risk
6.7 Summary and conclusions

This chapter presented the analysis of 117 questionnaires completed by health professionals who work with older people who have fallen and/or are at risk of falling. The results of quantitative rating scales demonstrate that there is wide and contradictory opinion amongst different groups of health professionals and different from the perceptions of the wider literature. However, behavioural risk factors and behavioural intervention measures were both rated as highly significant by respondents in the understanding and prevention of falls among older people.

Additional qualitative information described some of the key factors that are perceived as strains in the prevention process. Key issues included lack of time and resources, poor compliance by older people, and poor education and health promotion.

It was determined that further project research should focus on improving awareness and understanding of behavioural risk factors and interventions, specifically, compliance and type, suitability and adequacy of educational paradigms.
Chapter 7

APPLICATION OF THE TRANSTHEORETICAL APPROACH TO FALLS AMONG OLDER PEOPLE

7.1 Introduction

7.1.1 Outline of research presented in chapter

Earlier chapters (4, 5, 6) concluded that further investigation is required regarding the reasons for non-compliance and the types of education/health promotion that can increase levels of compliance. Furthermore, it was stated that little has been done to investigate educational approaches to falls (chapter 2, 4), emphasised by qualitative findings (chapter 6), which suggest that further information is required regarding the suitability of educational materials and the impact of these materials on perception of fall risk.

This chapter investigates theoretical models which greatly facilitate understanding of health behaviour and aid in the development of appropriate assessments and interventions. Such models can help people initiate and maintain health behaviours and lifestyle change. The Transtheoretical Model (TTM) (Prochaska and DiClemente 1983) proposes a set of stages that classifies an individual’s motivation readiness for engaging in behaviour change. This is a model that seems appropriate to the holistic ergonomics approach and principles and is applied for use in preventative strategies. It recognises that all people are different and that interventions should be targeted specifically for an individual, whenever possible and is an integrative model of behaviour change which incorporates some of the more useful concepts from other theories. This chapter describes the TTM, prior to using it to examine the health behaviours contributing to falls among older people, and suggests implications for characteristics of individuals at each stage in

* Abstracts of this work were presented at the 17th Conference of the European Health Psychology Society, Kos, Greece, 24-27 Sept 2003 and at the 5th Annual Evidence-Based Falls Conference, March 29-April 1 2004, Clearwater Beach, Florida
the TTM. The chapter concludes with the implications of this application of health psychology for health professionals in dealing with the epidemic of falls among the older population.

7.1.2 Aims

- To examine the contribution of health psychology framework to understanding fall related behaviour among older people
- To suggest characteristics of individuals at each stage of change in the TTM
- To understand whether information and advice can be better targeted for individuals
- To examine the use of this application of health psychology for professionals by suggesting processes and approaches that could be used to progress individuals through the stages of the TTM

7.2 Background

7.2.1 Health behaviour

Public health initiatives aim to modify behaviour by changing knowledge and attitudes, as these factors have a significant influence on exposure to health risks. Theoretical models of health related behaviour therefore could have much to offer health and safety with respect to falls among older people, in terms of awareness raising and behavioural modification.

7.2.2 Summary of theoretical models and health behaviour change

Theoretical models can facilitate understanding of health behaviour and aid in the development of appropriate assessments and interventions to help people initiate and maintain health behaviours and lifestyle change. Several of the health psychology theoretical models that have most influenced the study of health behaviour are briefly described below.

Health belief model

The Health Belief Model (Becker 1974) accentuates the importance of beliefs in behaviour change. This model posits that individuals are likely to change
when they believe they are at risk of developing a problem, when they believe that the recommended changes will improve their health status or reduce their risk, and when they believe they have the ability and resources to carry out the desired changes.

This is a useful concept as it is apparent from data collected in earlier chapters that perception of fall risk can impact on behaviour. However, this doesn't always make a difference to actual behaviour reported in fall risk. Although an interesting idea, this model does not suggest any clear pathways for a vocation in fall prevention.

Social cognitive theory

Social cognitive theory (SCT) is a model of human behaviour (Bandura 1977), that recognises behaviour, cognition and other personal factors, and the environment are all seen as influencing one another. The model suggests that their relative effects differ from one activity to another and from one person to another, but that each factor is taken into account when developing behaviour change interventions. The SCT also focuses on how people learn, and the process of making lifestyle changes represents a process of learning. This complex process may include adopting new behaviours, abandoning old ones and making simple changes. The importance of self-efficacy to engage in specific behaviours required for certain tasks is emphasized. Self-efficacy is a strong and consistent predictor of health behaviour change, across multiple types of behavioural and health conditions. The importance of learning by observing others and following the behaviour of role models is also emphasised.

Although this model has an all-encompassing approach by recognising the interacting influences of personal (intrinsic) factors, the environment and behaviour, the importance of learning by observing others and following role models is stressed. From the data collected in this thesis, it was not reported that learning from others was an especially frequent (or important) event in perception and understanding of fall risk. It was a far more regular occurrence for the individual fallers to learn from their own "mistakes".

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Although this model does have many important and useful facets, it is uncertain how it could be used in fall prevention, as it does not have a specific application in this context.

Relapse prevention model

The Relapse Prevention Model was created from the perspective of the study of relapse in the addictive behaviours (Marlatt and Gordon 1985). The model suggests that relapse represents a failure of efforts to change behaviour. Relapse is perceived as a progression rather than as one occurrence. Relapse prevention training has been successfully used in substance abuse, smoking cessation, and physical activity and dietary interventions.

This model is useful in the context of addictive behaviours. However, the health issue of falling cannot be classified as addictive; qualitative data suggests that relapse occurs due to older people not recognising risks, rather than a physical decision to return to risky behaviour. Therefore, in comparison, falls are a much more subtle ‘health behaviour’. Furthermore, the issue of falls among older people is not solely caused by a problematic health behaviour, it is also due to intrinsic and extrinsic risk and the interaction between risk factors.

Transtheoretical model

The Transtheoretical Model (TTM) proposes a set of stages that organise an individual’s motivation readiness for engaging in behaviour change (Prochaska and DiClemente 1983). Behaviour change in this model, as in the previous, is described as a process that addresses levels of action versus inaction, rather than an “all or none” phenomenon. Five basic stages of change are addressed. There are also other important steps involved in this model and include: ‘weighing the personal pros and cons’ of behaviour change (decisional balance), and; cognitive and behavioural steps involved in the process of making changes. Interventions using this model have successfully moved persons along the continuum of readiness for changing health behaviours by tailoring messages to match “individual” personal stage of change.
This is the model that seems the most appropriate to the holistic ergonomics approach and principles and is more applied for use in preventative strategies. It recognises that all people are different and that interventions should be targeted specifically for an individual, whenever possible. Although it is not the perfect solution for investigating falls among older people, for example, decisional balance may not be completely relevant for falls among older people, it is a useful starting point for examining the theoretical basis of health related behaviour. It is also an integrative model of behaviour change which incorporates some of the more useful concepts from the other theories summarised. The TTM is well accepted in health promotion. However, one major criticism of the model is that it is mainly prescriptive and does not tell us how or why a person moves from one stage to another. It has also been criticised for portraying too smooth a process of change, whereas change is often much more fluctuating and unpredictable (Heather 1991 in Katz and Peberdy 1997).

7.2.3 Detailed overview of the transtheoretical model

The TTM (Prochaska and DiClemente 1983; Velicer et al 1998) describes how people modify a problem behaviour or acquire a positive behaviour. The fundamental proposition of the model are the Stages of Change. The model also includes a series of independent variables, the Processes (or Stages) of Change, and a series of outcome measures, including the Decisional Balance and the Temptation scales. The Processes of Change are ten cognitive and behaviour activities that assist change.

The TTM is a model of intentional change which concentrates on the decision making of the individual. Other approaches to health promotion have focused primarily on the social influences on behaviour or on biological influences on behaviour. For smoking, an example of social influences would be peer influence models or policy changes. An example of biological influences would be nicotine regulation models and replacement therapy. However, within the context of the TTM, these are viewed as external influences,
impacting through the individual. These views are in line with how this thesis has viewed intrinsic and extrinsic factors for fall risk and prevention.

The model involves emotions, cognitions, and behaviour which includes a dependence on self-report. Accurate measurement requires a series of explicit questions that the individual can answer correctly with little likelihood of misrepresentation. Measurement issues are very important and one of the essential steps for the application of the model involves the development of short, reliable, and valid measures of the key constructs (Prochaska and DiClemente 1983).

The temporal dimension within the stages of change
The stage construct is the key idea of the model and important, in part, because it represents a temporal element. Change implies ‘phenomena occurring over time’ (Prochaska and DiClemente 1983). However, this aspect has mostly been neglected by other theories of change. Behaviour change has often been construed as an event, such as stopping smoking, drinking, or over-eating. The TTM interprets change as a process involving progress through a series of five stages, with the chance to move backwards as well as forwards. Using a staging algorithm, participants are classified into stages on the basis of their responses to a small number of questions, Figure 7.1.
Precontemplation is the stage in which people are not intending to take action in the projected future, usually measured as the next six months. People may be in this stage because they are uninformed or under-informed about the consequences of their behaviour. Alternatively, they may have tried to change a number of times and become demoralized about their ability to change. Both groups tend to avoid reading, talking or thinking about their high risk behaviours. They are often characterized in other theories as resistant or unmotivated or as not ready for health promotion programs. Instead, it could be construed that traditional health promotion programs are usually not designed for such individuals and are not matched to their specific needs (Velicer et al 1998).

Contemplation is the stage in which people are intending to change (often regarded as in the next six months). They are more aware of the advantages (pros) of changing but are also acutely aware of the negatives (cons). This balance between the costs and benefits of changing can produce profound hesitancy. This can keep people “stuck” in this stage for long periods of time, a phenomenon often characterised as chronic contemplation or behavioural procrastination. These individuals may not be ready for traditional action oriented programs.
Preparation is the stage in which people are intending to take action in the immediate future, usually measured as the next month. They have usually taken some significant action in the past year (Velicer et al 1998). These individuals have a plan of action, such as joining a health education class, consulting a counsellor, talking to their physician, buying a self-help book or relying on a self-change approach. These are the people that should be recruited for action-oriented interventions (e.g. programmes of smoking cessation, weight loss, or exercise).

Action is the stage in which people have made specific explicit modifications to their life-styles (usually described as within the past six months). Since action is discernible, behaviour change has often not been associated with action (Velicer et al 1998). However, in the TTM, action is only one of five stages and not all modifications of behaviour count as action in this model. People must achieve a standard that health professionals agree is sufficient to reduce risks for disease/injury. In smoking, for example, the principle that is used to demonstrate action is total abstinence, rather than a reduction in the number of cigarettes smoked, or switching to low tar/nicotine cigarettes. The action stage is the stage where vigilance against relapse is critical, as it is the time when individuals can become doubtful of their abilities and choice (Katz and Peberdy 1997).

Maintenance is the stage in which people are working to prevent relapse but they do not apply change processes as frequently as do people in action. They are less tempted to go back to earlier stages and become gradually more confident that they can continue their transformation. The new behaviour is strengthened and develops into self-efficacy. The individual's feeling of being in control is then maximised, and eventually the exit point to termination of the problem cycle is reaching and stable healthy behaviour is reached.

Relapse occurs when individuals revert to an earlier stage of change. People can regress from any stage to an earlier stage. Relapse tends to be the rule.
when action is taken for most health behaviour problems. Fortunately, it is reported that (in studies investigating smoking and exercise) only approximately 15% of people regress all the way to the Precontemplation stage. The vast majority regress to Contemplation or Preparation (Velicer et al 1998).

Determining when change occurs

The TTM also involves a series of intermediate, or outcome, measures. Typical theories of change involve only a single outcome measure of success, which is often a discrete variable. In contrast, the TTM proposes a set of ideas that form a multivariate outcome and include measures that are perceptive to evolution through all stages. These constructs include the Pros and Cons from the Decisional Balance Scale, Self-efficacy or Temptation, and the target behaviour (Velicer et al 1998).

Decisional Balance. The Decisional Balance theory reflects the individual's ideas of the relative importance of the pros and cons of changing. It is derived from the model of decision making (Janis and Mann 1977). The Decisional Balance scale involves weighting the importance of the Pros and Cons. A predictable pattern has been observed of how the Pros and Cons relate to the stages of change (Velicer et al 1998). Figure 7.2 illustrates this pattern for smoking cessation. In Precontemplation, as might be expected, the Pros of smoking far outweigh the Cons of smoking. In Contemplation, these two scales are more equal. In the advanced stages, the Cons outweigh the Pros.
A different pattern has been observed for the achievement of healthy behaviours. Figure 7.3 illustrates this pattern for exercise. The patterns are similar across the first three stages, although, for the last two stages, the Pros of exercising remain high. This may suggest the fact that maintaining a program of regular exercise requires a continual series of decisions while smoking eventually becomes irrelevant (Velicer et al 1998). Maintenance and sustainability of a ‘healthy falls behaviour’ could be comparable to that of maintaining a regular exercise regime. Similarly, disregard of particular elements of behaviour that are involved in fall risk, are comparable to smoking behaviour. These two scales capture some of the cognitive changes that are required for progress in the early stages of change.
Self-efficacy/Temptations. The Self-efficacy construct represents the 'situation specific' confidence that people have that they can cope with high-risk situations without relapsing to their unhealthy or high-risk habit. In the case of falls prevention, this concept would relate more to the self confidence an older person has of overcoming fall-specific challenges. This construct was adapted from Bandura's self-efficacy theory (Bandura 1977). This paradigm is represented either by a Temptation measure or a Self-efficacy construct.

The Situational Temptation Measure (DiClemente 1986) reveals the intensity of urges to engage in a specific behaviour when in the midst of difficult situations. It is, in effect, the converse of self-efficacy. The Situational Self-efficacy Measure reflects the confidence of the individual not to engage in a specific behaviour across a series of difficult situations.

Both the Self-efficacy and Temptation measures have the same structure (Velicer et al 1990) and are particularly sensitive to the changes that are involved in progress in the later stages, and are good predictors of relapse. Self-efficacy can be represented by increasing function across the five stages. Temptation is represented by decreasing function across the five stages. Figure 7.4 illustrates the relation between stage and these two constructs.

Figure 7.3 The relationship between stage and the decisional balance for a healthy behaviour (after Velicer et al 1998)
How Change Occurs

Processes of change are the activities that people use to progress through the stages. Processes of change provide important guides for intervention programs, since the processes are the independent variables that people need to apply, or be engaged in, to move from stage to stage. Ten processes (Prochaska and DiClemente 1983; Velicer et al 1998) have received the most empirical support in research to date. The first five are classified as experiential processes and are used primarily for the early stage transitions. The second five are labelled behavioural processes and are used primarily for later stage transitions (Velicer et al 1998).

**Experiential processes**

**Consciousness raising** involves increased awareness about the causes, consequences and cures for a particular problem behaviour. Interventions that can increase awareness include feedback, education, confrontation, interpretation, literature and media campaigns.

**Dramatic relief** initially produces increased emotional experiences followed by reduced affect if appropriate action can be taken. Psychodrama, role playing,
grieving, personal testimonies and media campaigns are examples of techniques that can move people emotionally.

**Environmental re-evaluation** combines both affective and cognitive assessments of how the presence or absence of a personal habit affects one's social environment such as the effect of smoking on others. It can also include the awareness that one can serve as a positive or negative role model for others. Empathy training, documentaries, and family interventions can lead to such re-assessments.

**Social liberation** requires an increase in social opportunities or alternatives especially for people who are relatively deprived or oppressed. Advocacy, empowerment procedures, and appropriate policies can produce increased opportunities for minority health promotion, gay health promotion, and health promotion for impoverished people. These same procedures can also be used to help all people change such as smoke-free zones, salad bars in school lunches, and easy access to condoms and other contraceptives.

**Self re-evaluation** combines both cognitive and affective assessments of one's self-image with and without a particular unhealthy habit, such as one's image as a couch potato or an active person. ‘Value clarification’ and ‘healthy role models’ are techniques that can move people to re-evaluate (Velicer et al 1998).

**Behavioural processes**

**Stimulus control** removes cues for unhealthy habits and adds prompts for healthier alternatives. Avoidance, environmental re-engineering, and self-help groups can provide stimuli that support change and reduce risks for relapse. For example, designed car parks that entail a two-minute walk to the office and putting art displays in stairwells are examples of reengineering that can encourage more exercise (Velicer et al 1998).
Helping relationships combine caring, trust, openness and acceptance as well as support for the healthy behaviour change. Rapport building, a therapeutic alliance, counsellor calls and buddy systems can be sources of social support.

Counter conditioning requires the learning of healthier behaviours that can substitute for problem behaviours. Relaxation can counter stress; assertion can counter peer pressure; nicotine replacement can substitute for cigarettes, and fat free foods can be safer substitutes.

Reinforcement management provides consequences for taking steps in a particular direction. While reinforcement management can include the use of punishments, it has also been found that self-changers rely on rewards much more than punishments (Velicer et al 1998). Overt and covert reinforcements, positive self-statements and group recognition are procedures for increasing reinforcement and the probability that healthier responses will be repeated.

Self-liberation is the conviction that one can change and the dedication and recommitment to act on that belief (e.g. willpower). Motivation research indicates that the more action choices people have for change, the higher the commitment. Three action choices that smokers may be presented with include cold turkey, nicotine fading and nicotine replacement (Velicer et al 1998).

Stage targeted processes
The TTM states that a person's stage determines their receptiveness to different forms of health education. It is suggested that people in the precontemplative stage are more influenced by graphic information about the specific health risks. However, it is advocated that skills training or practical advice is more appropriate for those individuals in the later stages, who have already decided to change their behaviour. Figure 7.5 (adapted from Reding et al 1999 and Kidd et al 2003) describes how the stages and the processes fit together, indicating the processes of change most frequently used to progress to a further stage. According to the model, at any point an individual may return to a previous stage before progressing to the next.
Figure 7.5 Overview of the processes of change most frequently used to process to a given stage (adapted from Reding et al 1999 and Kidd et al 2003)

It can be seen that at all stages the perceived ‘Pros’ and ‘Cons’ are paramount. The TTM emphasises the importance of acknowledging peoples’ intentions when designing, implementing and evaluating health interventions. An important practical advantage of the model is that it is relatively simple to apply. Previous work looking at specific health behaviours has shown that it is possible to assess stage of change using a few simple closed questions (Katz and Peberdy 1997).
7.3 Methods

This was a retrospective study, which used an opportunity to investigate previously collected data to apply a novel analysis to a difficult problem. The interview survey (chapter 4) used a series of closed and open questions to gather data on many aspects of fall related behaviour and risk (t=0). Retrospectively, these questions were re-examined with the TTM in mind and responses to 2 questions were focused upon. A year later (t=1), follow up telephone interviews were conducted (chapter 5) the responses from which were examined to determine differences in status in the cycle of behaviour from the baseline.

The approach was to apply the TTM in a reverse fashion, by using the framework to assess stage of change and then to examine characteristics of the individuals who were classified into each category; if health professionals can better understand the health beliefs of older people who are at risk of falling by using simple information about them to group them into a stage category, then the advice and approach that practitioners take can be tailored more appropriately to the needs of the older person.

7.3.1 Assessment of stage

The key questions asked that were used to ascertain the exact stage of change in the TTM at baseline were: “Have you changed any aspect of your behaviour due to fear of falling (e.g. take more exercise, have made environmental modifications to your home)?”, and; “Would you continue to make (further) changes to your behaviour due to fear of falling?”. The same questions were asked via telephone interview, one year after the home interview.

With the scope and timescales of this study, it was impossible to differentiate between Maintenance and Stable Healthy Behaviour. Furthermore, with the retrospective nature and limited questioning, in this analysis the Contemplation, Preparation and Action stages have been merged. This is a
common occurrence in such exploratory research studies, due to the difficulty in differentiating between these similar stages without detailed questioning (Prochaska and Velicer 1997). Furthermore, it was not felt that the attempting to differentiate between these stages was particular useful or appropriate for the health issue of falling, Figure 7.6. The possible responses to the questions and the resultant category are shown in the matrix in Table 7.1. Validation of responses was undertaken by collecting qualitative information from each individual to endorse their answer, which is described below.

**Figure 7.6 The adapted stages of change**

**Table 7.1 Matrix of stage responses**

<table>
<thead>
<tr>
<th>Key Question and Response</th>
<th>Stage of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you changed any aspect of your behaviour due to fear of falling?</td>
<td>Would you continue to make (further) changes to your behaviour due to fear of falling?</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Examination of key risk indicators for each participant, based on the Morse Fall Scale (Morse 1997) and the NSF(OP) guidelines (Department of Health
2001), gathered for research in chapter 4 were investigated and compared to individuals' progress in the TTM:

- Age
- Health status (according to MMBI score)
- History of falling (number of previous falls)
- Number of medications taken (4+ is highly scoring risk factor)
- Balance and/or gait problems
- Number of other intrinsic risk factors present (e.g. Parkinson's, stroke, vision problems)

The perceived Pros and Cons, e.g. compliance and sustainability issues that have been discussed through this thesis (chapters 3-6), have also been presented.

7.4 Discussion of results

Frequencies of stage

Of the 177 participants, the majority of the sample (80%) could be classified into the relapse and maintenance categories, with the responses of the fewest individuals indicating them to be in the contemplative stage, Table 7.2.

The distributions in this study imply that although 80% of individuals reported having made changes to their behaviour with regard to fall risk, just over half of these individuals would not consider making further changes.
Table 7.2 Frequencies of stage of change

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>% of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t=0</td>
</tr>
<tr>
<td>Precontemplation</td>
<td>14</td>
</tr>
<tr>
<td>Contemplation (+ Preparation and Action)</td>
<td>6</td>
</tr>
<tr>
<td>Maintenance</td>
<td>38</td>
</tr>
<tr>
<td>Relapse</td>
<td>42</td>
</tr>
</tbody>
</table>

Characteristics of stage

The characteristics of individuals at each stage of change are shown in Table 7.3, and discussed below.
Table 7.3 Group characteristics at each stage

<table>
<thead>
<tr>
<th>Characteristic of Group</th>
<th>Precontemplative</th>
<th>Contemplative</th>
<th>Maintenance</th>
<th>Relapse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t=0</td>
<td>t=1</td>
<td>t=0</td>
<td>t=1</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>73.8</td>
<td>78.2</td>
<td>69.2</td>
<td>69.1</td>
</tr>
<tr>
<td>Mean MMBI Score</td>
<td>20.5</td>
<td>20</td>
<td>23.7</td>
<td>23.3</td>
</tr>
<tr>
<td>% worry about falling</td>
<td>68.0</td>
<td>63.0</td>
<td>100</td>
<td>100.0</td>
</tr>
<tr>
<td>% fallen previously</td>
<td>60.0</td>
<td>63.0</td>
<td>90.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Mean number of medications taken daily</td>
<td>1.7</td>
<td>0.75</td>
<td>1.8</td>
<td>2.5</td>
</tr>
<tr>
<td>% who have a health problem related to falling</td>
<td>84.0</td>
<td>74.0</td>
<td>90.0</td>
<td>95.0</td>
</tr>
<tr>
<td>% who have a gait/balance problem</td>
<td>4.0</td>
<td>13.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean number of health problems per individual</td>
<td>16.0</td>
<td>20.0</td>
<td>17.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Maximum number of health problems</td>
<td>5.0</td>
<td>4.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Minimum number of health problems</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>% who live on their own</td>
<td>36.0</td>
<td>26.0</td>
<td>30.0</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Precontempation

"Precontemplators" were individuals who could see no problem with their current behaviour and expressed no intention to change. The characteristics of these individuals demonstrated that they were 'average' in most respects, including age, health status, living arrangements, and fall history (60% had fallen). However, they did report taking the fewest number of medications, although this difference was not statistically significant. A slightly higher proportion of this group lived on their own compared to contemplators or maintainers although this difference was not thought to be significant enough to impact upon stage of change.
**Contemplation**

"Contemplators" were considering changing their behaviour. It was interesting that this group accounted for only 6% of the sample. These individuals were the youngest and healthiest, although they all reported concern about falling and almost all (90%) had fallen in the last 2 years. With further analysis of the data, it could be interpreted that the types of falls had resulted in low (if any) levels of injury. Two thirds of these individuals were living with partners or family. The ‘family ties’ (in the form of environmental re-evaluation), encouraged by the relatively non-injurious nature of the previous falls, could have been an influencing factor on the individuals’ health beliefs.

There was a high proportion of health problems reported per individual in this group. It is possible that the poor health of the sample may have aroused extra attention from their GPs. This, combined with GPs’ knowledge of the individuals’ previous (relatively non-injurious falls), may have resulted in information being forthcoming from GPs or other health professionals, resulting in increased awareness and consciousness raising amongst this group.

**Maintenance**

"Maintainers" were individuals who continued making beneficial changes to their behaviour. Although these individuals continued to maintain their healthy behaviour, and had an average age range and health status, less than half (46%) of these individuals had fallen previously. It would be interesting to examine what is persuading this group to maintain their healthy behaviour. The fact that these are the individuals who are most likely to cohabit and therefore receive support from partners and family, may be an associated cause. The frequent use of ‘helping relationships’ at this stage in the TTM is apparent in the overview of processes of change (after from Reding et al 1999 and Kidd et al 2003).

Almost all of these people had a health issue related to falling, and the group had a high proportion of gait/balance problems, and reported taking the (equal) highest number of medications. High levels of polypharmacy may
indicate greater interaction with GPs and other health professionals, and hence increased likelihood of receiving advice and information on falls and related health.

**Relapse**

"Relapsers" had made some behavioural changes but had not maintained their actions. Almost 2/3 of this group (compared to 1/3 of each of the other groups) lived alone which may have been a factor. These individuals were also the oldest, frailest, took the most medication, and reported the most gait problems. Despite these factors, only 70% of these individuals stated that they had fallen in the last 2 years.

### 7.4.1 Stage of change at baseline (t=0)

The re-examined questions from the home interview survey (chapter 4) and the responses are shown in Table 7.4.

<table>
<thead>
<tr>
<th>Interview Question</th>
<th>Response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you made any changes to your behaviour due to fear of falling?</td>
<td>88 22</td>
</tr>
<tr>
<td>Would you continue to make (any more) changes to your behaviour due to fear of falling?</td>
<td>44 66</td>
</tr>
</tbody>
</table>

The majority (88%) of individuals reported having changed an aspect of their behaviour prior to the home interview due to fear about falling. 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, including accommodation designed for older/disabled occupancy, social services/NHS intervention, common sense/ease of use, disabled partner/relative (and acquisition of equipment), and due to relatives’ insistence. 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.
Reasons why changes had not been made included lack of awareness of the issues, and an indifferent, lackadaisical attitude.

Examples of future behaviour changes that individuals thought were acceptable included: adding grab rails on stairs/at doorways, fitting a downstairs toilet or stair lift, redesigning bathroom, e.g. walk in shower/bath, introducing a telephone/additional phone lines upstairs, simplifying the garden, removing ‘clutter’ and trip hazards, and relocating to a bungalow. Other ideas from the sample included: taking exercise; moving furniture from the bottom of the stairs in case of a fall on the stairs; getting a proper loft ladder; getting a motorised wheelchair (for use both in and out of the house); putting a white strip on internal steps to increase visibility; raising furniture (e.g. chair) for easier usage.

Discussion
It is interesting that the majority of the sample were classified into the relapse and maintenance categories, indicating that they had made or were making positive changes, even though 50% of the total sample had not fallen in the last 2 years. This indicates that the individuals in the sample had a high perception of self risk, independent of fall history, which is contrary to previous findings (Wells and Evans 1996). It was interesting, however, that less than 1% of the sample reported that they knew someone (other than themselves) who was at risk of falling or who had had a fall. This suggests that this cohort of older people did not understand the risks for falling: at least one third of people aged 65 or older, fall each year. Despite these factors, the cohort still have a high perception of self risk, indicating that an understanding of fall risk or a fall history are not important in risk perception.

These findings could be used to generalise that younger, fitter individuals are more receptive to the concepts of fall risk. The more defiant behaviour appears to be among the older individuals who are more likely to have a (injurious) fall. It has been reported previously that older people do not want to feel old; making changes may feel like they are accepting the inevitable.
Despite suggestions above that a proportion of contemplators and maintainers had received information and advice from their GPs, only 5% of the whole sample reported that they had previously received advice on falls and fall risk, although 50% of total sample had fallen.

### 7.4.2 Stage of change one year later (t=1)

One hundred and fifty participants were re-interviewed one year after the home visit, a retention rate of 85%. The questions and their responses are shown in Table 7.5. Information was collected on falls over the course of the year, although no further information on health status was gathered.

<table>
<thead>
<tr>
<th>Interview Question</th>
<th>Response (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Since my visit have you felt more aware of the risks of falling?</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td>Since my visit have you changed any aspect of your behaviour due to fear of falling?</td>
<td>92</td>
<td>8</td>
</tr>
<tr>
<td>Would you continue to make any (more) changes to your behaviour due to fear of falling?</td>
<td>37</td>
<td>63</td>
</tr>
</tbody>
</table>

The majority (92%) of individuals reported having changed an aspect of their behaviour since the home interview due to fear or 'concern' about falling. Specific changes included 'trying not to hurry' and 'trying not to leave clutter lying about', see Table 5.7, although the category with the highest frequency was that of 'take more care generally', with just under one half of all responses. Of the 37% who reported that they would continue to make (more) changes to their behaviour due to a concern about falling, the types of changes were rarely specific, see Table 5.8. Although positive, they tended to be quite vague; only 5% of respondents gave specific examples of changes that they would make. The vast majority of responses were corresponding to "I'll make any (future) changes I need to". This suggests that a large proportion of the overall participants were receptive to change, but additionally that these older people were not entirely definite about the steps they could
put in place to reduce fall risk as they become older and/or less able. This was endorsed with the responses examining the reasons for not making any further changes: 50% of these individuals could not think of any further changes they could make to their behaviour, with the remainder of this subgroup responding that changes to their behaviour were "unnecessary" or "pointless". It could be suggested from these findings that education should play a role in enlightening older people at risk of falling about the issues and the steps they can make, in order that they know what they are able to do as they get older.

Just under half of the sample reported that the home interview they had experienced one year prior to their final telephone interview had made them feel more aware of the risks of falling (41%). This has interesting implications for falls education and prevention. Participants were also asked whether since the researcher's visit, they had 'taken more care' in their homes. Over three quarters (77%) of the sample reported that the interview had "made them think about fall risk in the home and take more care". A small proportion of the group (15%) reported that the visit had not affected their way of thinking because they 'had always taken care'. Less than 1 in 10 participants reported that the visit had had no influence on their subsequent behaviour (8%).

Almost two thirds of the respondents (63%) stated that they would not continue to make any further changes to their behaviour. As well as the fact that individuals could not think of any further changes they could make (50% of responses), participants felt that it was unnecessary to make changes at the time of asking, or that falling was simply an inevitable part of aging, see Figure 5.11.

**Frequencies of stage**

Similarly to baseline data, a year later the majority of the sample (92%) could be classified into the relapse and maintenance categories, with the responses of the fewest individuals indicating them to be in the contemplative stage, Table 7.2. The figures did alter over the time period, with movement from one
category to another, Figure 7.7. Analysis of specific movements are shown in Table 7.6-7.9.

![Diagram of adapted stages of change with frequencies of stage, t=0 ⇒ t=1](image)

Figure 7.7 The adapted stages of change with frequencies of stage, t=0 ⇒ t=1
Characteristics of stage

Precontemplation

A small proportion of the sample were categorised as precontemplative at the end of the year period, indicating that the majority of the participants were receptive to changing their behaviour or their environment to reduce fall risk. Interestingly, of this precontemplative sub-group (at t=1), 2% of the sub-sample had not moved from this stage (i.e. continued to be unreceptive to falls issues), and the remainder had moved ‘negatively’ from other areas of the cycle, Table 7.6.

<table>
<thead>
<tr>
<th>Previous stage (t=0)</th>
<th>%</th>
<th>Later stage (t=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Contemplation (+ Preparation and Action)</td>
<td>&lt;1</td>
<td>Precontemplative a year later (5%)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>Relapse</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

One year later the individuals in this group now comprised of the oldest, with the lowest MMBI scores. Despite this, these individuals were prescribed the fewest medications, and were the group that reported the lowest number of health problems related to falling. However, the low MMBI score could be accounted for by the high number of gait problems amongst this population. Although two thirds of this group reported to be worried about falling, the incidence rate of falls was the lowest in this classification. Only a quarter of this group lived alone, which was the lowest proportion of all the stage groups.

It appears that the stalwart of this sub-group who cannot be progressed to sustain safe behaviours are an old but healthy cohort. They are not unduly worried about falls, possibly because the incidence rate of falls is average. If falls are not occurring at a high rate then they may feel that it is inconsequential to make changes. The high level of cohabitation amongst this sub-group is significant as this may be a factor in choice and attitude.
Contemplation

Similarly to baseline figures, only a very small proportion of the whole sample were categorised as being at this stage of change (3%), Table 7.7. One individual had moved on from the precontemplative stage, and 2% of the sample had moved ‘negatively’ from the maintenance stage. No one had remained at the contemplative phase from baseline to t=1.

<table>
<thead>
<tr>
<th>Previous stage (t=0)</th>
<th>%</th>
<th>Later stage (t=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Contemplation (+ Preparacion and Action)</td>
<td>0</td>
<td>Contemplative a year later (3%)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Relapse</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Again, similarly to baseline data, the individuals in this group were the youngest and fittest (with the highest MMBI score), although took the highest number of medications and had a high number of health problems related to falling. However, all of the sub-group reported to be worried about falls, despite the fact that this was the sub-group of which the lowest number had fallen previously. It was interesting that the population in this sub-group were the most likely to live alone as this have made them feel more at risk of a long lie after falling. The size of this sample is very small so it is difficult to generalise overall about the characteristics of this sub-group.

Maintenance

One third of the overall sample could be categorised as maintainers a year after the home interview, Table 7.8. Half of these individuals had been categorised as maintainers at both t=0 and t=1, and therefore had remained at a constant position in the cycle. One third of maintainers at t=1 had moved ‘negatively’ from the relapse category, where they had been categorised at baseline. The remainder of this subgroup (6%) had moved positively from earlier stages.
Table 7.8 Maintainers' history, t=0 to t=1

<table>
<thead>
<tr>
<th>Previous stage (t=0)</th>
<th>%</th>
<th>Later stage (t=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Contemplation</td>
<td>2</td>
<td>Maintenance a year later</td>
</tr>
<tr>
<td>(+ Preparation and Action)</td>
<td></td>
<td>(34%)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Relapse</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

The general characteristics of individuals in this stage category confirmed that maintainers were relatively old compared to the overall sample and that more than 80% of this sub-group worried about falling, as two thirds of individuals had fallen previously. However, this high perception of fall risk is interesting, as it is higher than average compared to the proportion of fallers amongst the sample. The number of medications taken, gait problems and other health issues reported were average compared to the other stage groups. Just under half of maintainers lived alone.

Relapse

Relapse was the most common stage of change for participants to be categorised into, at both t=0 and t=1, Table 7.9. Approximately half of this sub-group were categorised as relapsers throughout the study, and therefore did not move along the continuum at all. Just under half of this sub-group had previously been categorised as maintainers and moved in a positive direction into the stage of relapse. The remainder of relapsers had moved positively through the cycle from early stages of change.

Table 7.9 Relapsers' history, t=0 to t=1

<table>
<thead>
<tr>
<th>Previous stage (t=0)</th>
<th>%</th>
<th>Later stage (t=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Contemplation</td>
<td>3</td>
<td>Relapse a year later</td>
</tr>
<tr>
<td>(+ Preparation and Action)</td>
<td></td>
<td>(58%)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Relapse</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
These individuals were average in terms of age and health status. Two thirds reported to be worried about falling and the same proportion had fallen previously. Approximately half of the individuals in this sub-group lived alone.

Discussion

A large proportion of the cohort (43%) remained in the same stage of change from t=0 to t=1. The majority of this group consisted of 25% 'relapsers'. Just over half of the cohort (52%) moved forwards positively through the cycle. However, 33% of the overall sample moved forwards 'too far' and ended up in relapse, because they reported that they would not make any further changes to their behaviour. From examination of the qualitative data, it is felt that the majority of this sub-group gave this response, not because they were unreceptive, but because they were uncertain of the further action they could take. This has important and urgent implications for the need for sustained fall intervention. Only a very small percentage of the cohort (3%) moved backwards through the stages, with a more negative view at t=1 than at baseline.

These findings suggest that the participants were very receptive to change, whether independently or as a result of the interview at t=0. From qualitative comments, it can be suggested that the home interview played a role in raising awareness of the issues. However, the role of the interview cannot be verified as a technique in fall prevention because there was no control group to compare these results with.

Although suggestions are made above regarding the characteristics of the different stage sub-groups, with such a relatively small sample, no firm conclusions can be drawn. The approach has, however, raised some interesting issues which could be examined further in future work.
7.5 Discussion of the approach

7.5.1 Application of the TTM to fall behaviour

There are differences in applying the TTM to falls among older people compared to the health issues that have previously been investigated, e.g. diet, exercise, smoking. There are several complicating issues.

As well as the usual issue of risk perception and self protective behaviour contained in the constructs of threat-related beliefs, self-efficacy, response efficacy, and safety climate, an additional facilitating condition is that people do not want to feel old. By making changes to their behaviour or their environment they may feel as though they are prematurely ageing or accepting that they are deteriorating in ability.

Furthermore, relatively large changes (in behaviour) need to be made for the possible occurrence of a comparatively low probability event. For example, an older person may take many steps but it’s only one in several thousand that contributes towards a fall. Additionally, a fall may be less likely to result in death compared to a smoking-induced heart attack, although these are probabilities that are particular to each individual.

Therefore, the relative probability, combined with risk perception factors and the psychological negativities of ageing, make the use of this model to assail falls among older people a less simplistic option than for other health related behaviours.

Despite these issues, it is felt that this approach (with further examination and modification to incorporate some of the factors raised in this study) could be a useful tool for health professionals in assessing patients’ readiness to change and acceptance of fall interventions; it is obvious that if simple questioning could elicit stage of change and specific educational tools were to be developed to assist with stage changing, then health practitioners could use this process to target education and other interventions to better effect.
Since much injury prevention focuses on behaviour change, it is reasonable to believe the TTM might be a useful framework in injury prevention research (DeJoy 1996), although there are not currently any injury prevention studies based on the TTM (Kidd et al 2003). Therefore, further research is required to investigate the role of the TTM in falls prevention.

7.5.2 Suggestions for fall prevention

The stage of change approach which enables people to be classified according to their reported behaviour is not a sufficient basis for developing interventions; instead one needs to additionally specify the factors that need to be changed in order to produce the desired stage transitions (Velier et al 1998).

Older people

Success in making such changes will depend upon the extent to which older people recognise that there is a problem as well as their attitudes toward the proposed solution. Individuals may not recognise there is a safety issue to be addressed due to lack of knowledge and understanding about a particular hazard. Alternatively they may have the information but distrust the source or choose to discount it due to other constraints.

Although currently under-investigated and (hence) under-valued, it is suggested (chapters 4-6) that older people are receptive to educational interventions, particularly peer group information. More work is necessary to determine specific educational interventions for fall risk. However, from the findings of earlier chapters (2, 3, 4, 5, 6), samples can be suggested for some of the pertinent processes of change (see section: How change occurs, after Velicer et al 1998). Having used different methods to investigate the behavioural processes of change in the TTM (chapters 2-6), it is not felt that all of the processes are particularly relevant to falls among older people.

The first two experiential processes of change (Figure 7.8) involve increased awareness about the causes, consequences and interventions for falls. It can be suggested that useful consciousness raising techniques include peer
mentoring on the consequences and risks (including within group sessions), and support from family at home, as well as properly designed educational flyers and media campaigns. Personal testimonies during peer mentoring and evocative media campaigns could be useful methods of dramatic relief. Environmental re-evaluation may include the peer mentoring and media campaigns along with information aimed at carers and families, including case study materials. Additionally, it may be pertinent to raise the point with older people that a serious fall will also cause upset and concern amongst family and friends, and possibly a loss of independence for the individual. Older people can experience social liberation by being empowered about what choices they have to help themselves stay fit and healthy, in their own homes. This information could include facts and figures about falls and risk, simple practical measures that can be undertaken and how to go about getting help or assistance to implement these changes, e.g. equipment, aids, improved access, exercise classes. Recognising and being informed on these issues can assist with self re-evaluation, for example with the mindset, “I am older and have limitations but I know how to cope”.

<table>
<thead>
<tr>
<th>Processes of Change: Experiential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consciousness Raising [Increasing awareness]</strong></td>
</tr>
<tr>
<td>Information on what an older person can do to improve safety and health regarding fall risk</td>
</tr>
<tr>
<td><strong>Dramatic Relief [Emotional arousal]</strong></td>
</tr>
<tr>
<td>Emotional warnings about fall episodes and fall risk</td>
</tr>
<tr>
<td><strong>Environmental Re-evaluation [Social reappraisal]</strong></td>
</tr>
<tr>
<td>Education for family/friends/carers about fall risk; information for older people on personal consequences of fall</td>
</tr>
<tr>
<td><strong>Social Liberation [Environmental opportunities]</strong></td>
</tr>
<tr>
<td>Facts and figures about falls and fall risk, simple practical measures that can be undertaken and how to go about getting help or assistance to implement these changes</td>
</tr>
</tbody>
</table>

Figure 7.8 The experiential processes of change with sample items for fall related health behaviours and beliefs (based on findings, chapters 2-6)
Processes of Change: Behavioural

**Stimulus Control [Re-engineering]**
Removal of cues for unhealthy habits and addition of prompts for healthier alternatives

**Helping Relationship [Supporting]**
Discussion with peers/family/health professionals about the support available

**Reinforcement Management [Rewarding]**
Review with peers/family/health professionals about progress and additional support available

Figure 7.9 The behavioural processes of change with sample items for fall related health behaviours and beliefs (based on findings, chapters 2-6)

The behavioural processes of control (Figure 7.9) include stimulus control which is pertinent regarding environmental change such as removing cues for unhealthy habits and adding prompts for healthier alternatives, e.g. removal of step ladders, relocation of supplies to easy access positions. Avoidance, environmental re-design, and self-help groups can provide stimuli that support change and reduce risks for relapse. Helping relationships combine care and acceptance as well as support for the healthy behaviour change, and may come from peer mentoring, as well as from support from family and health professionals. Reinforcement management can again include peer education and discussion alongside review by health professionals.

**Other stakeholders**

If such a tool were to be developed for health practitioners to use in fall prevention work, they would need to be receptive to using such a method. Therefore, it may be pertinent to examine the opinions of health practitioners themselves, e.g. perceived benefits and disadvantages of fall interventions, to assess their stage in the cycle. If this is known, then they can be better informed as to the options that are open to them and more compliant to working together (difficulties discussed in chapter 6). However, it is important to note that stage of change may vary across roles and between individuals (Haslam 2002).
Due to the potential role that family/carers/friends may be able to play in fall prevention (dependent on the circumstances of each older person), as highlighted above, it may also be useful to assess their stage of change. By assessment and subsequent targeted education, their role could be strengthened.

7.5.3 Appraisal of the approach

There were several difficulties with the approach. Due to the retrospective application of the TTM, only two questions were suitable for analysis using the principles of this model. If the application had been addressed prior to the home interview survey (chapter 4), additional, more detailed questions could have been added, particularly regarding timescales of change. However, qualitative data was collected on the types of changes which was useful when examining and reinforcing concepts within the data.

The number of older people in the cohort was perhaps on the small side for this type of application, particularly when attempting to examine characteristics of sub-groups within each stage of change. However, as earlier stated, this was an exploratory study and a new concept within the application of fall prevention and larger studies would need to undertaken to explore in more detail the ideas generated from this study.

7.5.4 Implications for future research

Some interesting issues have been raised which could be examined further in future work. As well as examining the use of the staged approach in understanding the opinions and perceptions of older fallers, the efficacy of different types of behavioural fall interventions should be scrutinized. Various types of educational techniques have been raised in this study and it would be useful to examine their design and implementation in fall prevention using randomised controlled trials. With an improved understanding interventions could be targeted more usefully and suitably, and so reducing falls and fall-related injury.
As suggested above, it may also be pertinent to examine the opinions of health practitioners and carers/family and to assess their stage in the cycle so that they can be better informed as to the options and able to play an improved role in fall prevention.

7.6 Summary and conclusions

The application of health behaviour models has not previously been undertaken concerning the prevention of falls among older people. The findings of this initial study suggest that, with further examination, processes of change that are targeted to older people’s beliefs and perceptions could facilitate safer behavioural practices, resulting in fewer falls, fewer injuries and improved quality of life.

It appears that the literature needs a consistent theoretical approach to link educational interventions with behavioural change and health outcomes, by identifying precursors to behaviour change and developing knowledge about how certain subgroups implement the change process (Kidd et al 2003). Further use of the TTM in fall prevention and other injury prevention research would promote better understanding of the stages of change and change processes. The TTM can additionally assist in examining intervention effectiveness and long-term efficacy.
Chapter 8

DISCUSSION AND CONCLUSIONS

8.1 Chapter summary

This chapter reviews the key findings of this work in relation to the research aims set out in the beginning of this thesis and explains them within the context of this and prior research examined in chapter 2. A general discussion then follows, concentrating on the universal research aims. The implications of the research for furthering the understanding of the research problem are also addressed and the contributions to the knowledge offered by this research are suggested. A critique of the research methodology and the consequences of this for the generalisability of the findings are specified. Ultimately, ideas for the direction of future work are summarised and final conclusions from the work are presented.

8.2 Review of key findings in relation to research aims

The main aim of the research was to provide an understanding of how behaviour contributes to falls among older people in and around the home. The research initially focused on the behaviour of older people, but it soon became apparent that the behaviour of other stakeholders (e.g. friends, family and carers of older people, including health practitioners) was important.

Within these overlying aims, several specific research objectives were set (1.3.1). This section reviews research findings with regard to these objectives and explains them within the context of this and prior research examined in chapter 2. A general discussion then follows, concentrating on the universal research aims and a model of the findings is presented.

* The main concepts in this chapter were presented at the Annual Conference of the Ergonomics Society, Swansea, April 2004 (Brace et al 2004)
8.2.1 Patterns of behaviour in the home influencing risk of falling

The first research objective was to examine patterns of behaviour in the home environment that were likely to affect an older person's risk of falling. A triangulated approach was used for this investigation. It was found that many behaviours can influence fall risk including behaviour affecting direct use of the home environment, behaviour affecting individual capability and behaviour affecting the home environment. The behavioural types corroborated those described by Hill et al (2000) and Haslam et al (2001) in their work investigating stair safety. However, this research also offered additional perspectives which are discussed below, by behavioural type.

Behaviour affecting the direct use of the home environment

From investigations in chapters 3-5, behaviour affecting direct use of the home environment and fall risk included cleaning, house maintenance, bathing, walking / moving about (including at speed), carrying, and reaching/stretching. These findings are comparable to those found by Hill et al (2000) and Haslam et al (2001) regarding use of the stairs. However, this research also includes bathing and reaching/stretching (e.g. to lift or move items) as factors in behavioural fall risk: this research investigates behaviour throughout the home environment, not just the stairway.

Findings suggest that older people move around their homes as and when necessary, but that movement is reduced by declining abilities. Use of necessary conveniences, such as the lavatory, may require increased actions. Other activities also lead to increased movement, for example, cleaning or preparing to go out. Cleaning around the home appears to present particular problems, due to a combination of difficult access and the need to use awkward equipment. Dependant on whether a person lives with someone else or on their own can affect behaviour and movement around the home. These findings reinforce the messages presented by Hill et al (2000), although this research imparts greater breadth to the findings by offering a wider perspective of behaviour affecting use of the entire dwelling.
Behaviour affecting the home environment

These types of behaviours suggested by interviewees to affect fall risk included negation of the use of lighting and detrimental maintenance and upkeep of the home environment. The latter was primarily indicated as 'clutter', but also involved choice of environmental design and features that could increase extrinsic risk, e.g. low stools, rugs. Hill et al's (2000) research suggested some similar issues: interviews with older people suggested that individuals do not switch the stair lights on when going downstairs during the night; additionally, it was common for items to be left on the stairs; these factors were found to be predominant in this research also. However, this set of data offers supplementary information on the way in which older people furnish and devise their homes and the implication for subsequent fall risk.

Instances of unsafe behaviour in the home were identified with respect to all of these descriptions. Frequently, the individual's outlook seemed to be that while an activity might be hazardous, the manner in which they undertook it reduced their risk to an acceptable level. For example, leaving objects, e.g. shoes, on the floor was considered reasonable, although the placement of rugs was considered more problematic. This was possibly because, in the case of the former, the risk was seldom permanent. The conviction that older people expressed about how the nature of their actions reduced risk of falling whilst embarking on a hazardous activity, was interesting. It is not thought that this area of risk perception has been suggested previously, particularly with regard to falls among old people in the home.

There appeared to be little appreciation that an individual's actions might have implications for the safety of others in the home. For example, items placed on the floor might form a trip hazard for another person who does not know the objects are there. It can be suggested from the findings that within the type of behaviour that affects the home environment, there are two classes of behaviour; that of an individual themselves and that of any co-inhabitants or visitors, e.g. grandchildren. This is a novel idea as it has not previously been suggested that anyone other than the faller has a role to play in fall risk.
Older people may continue with some actions, regardless of facing problems and suffering concern about safety, e.g. climbing up on things to clean windows. It could be perceived from the participants in the study that pride and a desire to maintain standards and routine were encouraging them to continue with this behaviour. This suggestion has been offered previously and endorses earlier studies examining behaviour on the stairs (Hill et al 2000; Haslam et al 2001).

**Behaviour affecting individual capability**
The decline of functional ability with age is well documented (Skelton et al 1994; Luukinen et al 1995). Most individuals appeared to appreciate what to expect in terms of changing functional ability with age, although many did not perceive themselves as being old. It is possible, however, that the often gradual deterioration in physical and mental abilities lead some to not always fully understand their limitations.

There were many different behaviours that affect an individual's physical capability, including use of medications, spectacles, walking aids and clothing. These were all reported as risk factors for falls amongst this cohort, reinforcing claims made by Hill et al (2000). However, this study also offers a wider range of data as it is not solely concentrating on the stairs in the home. There was anecdotal evidence that one's physical capabilities impact on extent, nature and choice of behaviour. This is discussed further in 8.2.2.

**8.2.2 The interaction between multiple risk factors for falls**
The second research objective was to investigate the interaction between multiple fall risk factors. As discussed in chapter 2, the intrinsic, physical capabilities of older people, and to a lesser extent, the environment in which older people dwell, and their mental capabilities, have been discussed as risk factors for falls. Little previous investigation has been carried out into behavioural risk factors, with little subsequent discussion. The suggestions in this thesis endorse the judgements from the literature regarding physical,
environmental and mental risk factors (Tinetti et al 1988; Cwikel et al 1990; Campbell et al 1989; Davis et al 1999; Masud and Morris 2000). However, new views from additional qualitative evidence have been offered: behaviour has been reported by older people in chapters 3-5 as being an implicit component in fall risk.

Furthermore, from the indications in this thesis there are a selection of additional psychological and peripheral risk factors. Psychological risk factors include past experience, confidence, autonomy, recognition and acceptance of fall risk, recognition and acceptance of fall consequences, recognition and acceptance of physical and mental limitations expectation, risk perception, and personality and attitude. Peripheral risk factors include socioeconomics, financial and physical support from family, friends, and advice and education from other people.

The original design and features of the environment (e.g. steps, slopes, floor surfaces) impact on how an individual is able to interact with it, dependant on physical capabilities. The socioeconomic background of the individual may have an effect on the design and features of the environment and on the attitude of the individual. Advice and education from other people can affect attitude and beliefs, perception of risk and whether an individual recognises their limitations. Personality and/or attitude and perception of risk also have a role to play in the extent of an individual's recognition of their limitations.

Physical capability has an effect on the individual's behaviour in the home, as this determines whether an individual can physically manage certain behaviours, e.g. cleaning, carrying out DIY activities.

It was perceived by the older people in this research that the condition of physical capability influences the amount of mental alertness that is required to move (e.g. ambulate) safely. For example, a frail individual may need to concentrate greatly on each physical movement to ensure that a fall does not occur. However, it is rare that in old age, mental and physical capabilities are optimal for all individuals; hence individuals are required to weigh up the
probability of falling against mental and physical capabilities and adapt their behaviour accordingly.

Physical capability also has a role to play in the individual's level of expectation of fall risk; from comments it can be perceived that generally, the frailer the individual, the higher the expectation of falling. From this qualitative evidence it can be suggested that an individual's expectation of falling has an impact upon an individual's recognition and acceptance of fall risk.

It was suggested by participants that past experience of falls can impact on behaviour as well as upon the confidence of a person. Confidence in turn can affect the extent, nature and choice of behaviour and upon the mental capabilities that an individual will draw upon when moving about their home.

An individual's behaviour is affected by the extent of their recognition and acceptance of consequences of a fall and fall risk, as well as their physical capability. From qualitative analysis, the state of an individual's physical capability appears to affect recognition and acceptance of fall risk.

From the evidence in this thesis, it can be suggested that psychological perspective is an interacting component in fall risk and in the reasoning behind behaviour. If this could be investigated and psychological state and/or mindset changed, perhaps safer behaviours and a consequent reduction in falls could result.

Therefore, it can be suggested from this thesis' examination of fall causation that the proportions of the three overlying risk factors (intrinsic, extrinsic and behavioural) can vary in each fall event. These are dependent on the individual, the environment and the behaviour (task) but that all components are interacting and multi-dependent. The studies in this thesis (chapters 3-6) confer with previous studies (Lord et al 2001; Gillespie et al 2003) in that there are many complex interactions occurring in fall risk.
It is comprehensible that as another risk factor is added to the scenario, the impact that it can have on the other areas of risk may increase the overall risk by a significant proportion. Therefore, the sum of the overall risk is greater than the sum of the individual risk factors.

8.2.3 Older people’s knowledge of factors affecting risk of falling
The third objective was to examine the extent and accuracy of older people’s knowledge affecting risk of falling. There was general consistency in the data with respect to participants’ attribution of the causes of their falls. Extrinsic and behavioural factors were perceived by older people as common fall initiating mechanisms.

The most serious behaviours which older people thought placed them at increased risk of falling in the home included leaving items on the floor (clutter) and rushing (chapters 3-4). These data correlate 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 among the fallers in the sample (chapters 4, 5). Although such behaviours are believed by older people to increase risk, respondents reported that they carry out such actions (8.2.1). Other behaviours that the cohort 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 (chapters 4, 5).

The use and design of footwear and walking aids appeared to be causal in a proportion of falls (chapter 5), confirming previous perceptions of risk (chapter 3, 4). The role of slippery floor surfaces and changes in level (particularly in the garden) were evident, resulting in approximately 25% of reported falls (chapter 5), which endorsed suggestions from earlier studies (chapters 3, 4).

The side effects or ‘latency periods’ of prescribed medication were raised on several occasions during the fall notification phase (contributing to 4% of
falls), although the issue was given very little emphasis during the interview survey (chapter 4). Conversely, although suggested by older people as an issue in the home interview survey, the use or misuse of spectacles was not mentioned at any time as an issue in the reported falls over the year period. Furthermore, poor vision was felt to contribute to falls (chapters 3, 4) although was only reported to be a factor in a minimal amount of episodes described during the notification period (3%) (chapter 5).

The strong relationship between the high perception of fall risk and actual falls reported in the garden due to extrinsic risk factors demonstrate a good understanding of some of the frequent risk factors, e.g. changes in surface/level, slippery surfaces.

Participants that had fallen occasionally reported that only one factor had played a role in a fall. However, the multi-causal nature of falls among older people is already well-established from other research (Close et al 1999; Scott et al 2001; Feder et al 2001) and this minority opinion is contrary to the reviews in the literature (AGS 2001; Gillespie et al 2003) and to the majority of anecdotal evidence collected in chapters 3-5. There is almost always a secondary or tertiary component involved, such as a psychological (classified as an intrinsic) issue, e.g. experience, expectation, recognition. It is apparent from examining the individual, the environment and the behaviour (task) directly heralding a fall that there are many variables that can be managed before a fall is sustained.

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. 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.
These data offer new perspectives on older people's perceptions and knowledge of fall risk which have not previously been investigated. The data also offers preliminary feedback as to the extent and accuracy of people's opinions and the relative proportions of fall risk that are actually involved. However, it is worth noting here that respondents might not be able to identify precisely what had played a part in a fall they had experienced. This point is expanded in 8.3. There is no information in the wider literature pertaining as to the proportion of falls that are contributed by the intrinsic factor described above (e.g. effects of medication use, vision).

8.2.4 Older people's views of interventions and barriers to change

The fourth objective of the thesis was to 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 accept, and barriers and facilitators to change. This was a novel approach not previously undertaken. The triangulation approach was used to collect this information (chapters 3-5) and a health psychology framework was used to investigate the quantitative and qualitative responses (chapter 7).

The nature of fall safety advice that older people are likely to act upon

Only a very small proportion of the cohort (5%) reported having received any advice on falling from health professionals prior to participating in the studies. The individuals in the focus groups (chapter 3) and interviews (chapter 4) 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 by participants that prevention is very important to reduce the number of falls among older persons. The use of safety literature and peer education with regard to falls among older people have not been previously studied. However, these techniques have been reported as useful for encouraging
healthy behaviours in the wider health promotion literature (Katz and Peberdy 1997). The use of the transtheoretical approach (chapter 7) to understand possibilities for targeting health promotion relates to this issue and requires further investigation.

The influence of friends and family was proposed by older people to have had an impact on behaviour and choice of activity regarding fall risk (chapters 3-4). It was commonly reported for a son or daughter to have removed equipment that they thought had an implication for falls and qualitative findings suggested that many of the participants had been warned of the dangers by their concerned family and friends. It was interesting to note that for some individuals, finding out about fall incidents occurring amongst their peers had an impact on their perceptions of risk and their subsequent behaviour. As might be expected, personal experience, involving either the individual or an associate, appears to have an effect on self-perceived safety. There is considerable prior research showing that experience affects perception of risk (Wells and Evans 1996). An explanation for the effect of personal experience on the perception of injury risk may be provided by the 'availability heuristic'. According to this theory, people judge an event as more likely if instances of the event are easy to recall or imagine (Tversky and Kahneman 1973).

At the end of the prospective study (chapter 5) it was implied by older people that the impact of an educational home interview may increase awareness of fall risk, change risk perception, and result in changes to behavioural practices. The educational components of the interview consisted of general thought provoking questioning about what older people think are the risk factors for falls. As well as giving the cohort information, the session was also requiring them to think about the issues and offering them examples of case study fall examples. Just over half of the sample reported that the home interview they had experienced one year prior to their final telephone interview had made them feel more aware of the risks of falling (41%). However, it is uncertain as to whether this increased awareness made any difference to
their exposure to fall risk, e.g. the actions they chose to challenge themselves with, as this was not a monitored variable.

Although falls among older people are complex events, involving many factors, there is evidence that concerted intervention can reduce their number and severity. Encouragement comes from recent studies, which have shown programmes to be beneficial (Close et al 1999; Steinberg et al 2000, Gillespie 2003). However, essential for this is that the different agencies working with older people recognize and take the issue as a priority and then subsequently collaborate effectively to address the problem.

These ideas have interesting implications for fall education and prevention, perhaps hitherto unrecognised (AGS et al 2001; Gillespie et al 2003). Routes for education are many and approaches need to be tailored to different circumstances (Prochaska and DiClemente 1983). Whatever the ensuing response, it is imperative that policy makers and guidance writers realise that that older people are key stakeholders in this design process. In terms of when to start this development, it may be appropriate to begin at the time people retire, when most are still active enough to be able to make changes to the physical environment for themselves, also avoiding problems there may be communicating with some people as they age (Wright and Whaley 1994).

**Modifications that older people are willing to accept**

A majority of participants (69%) reported having made environmental modifications to their homes prior to being interviewed (chapter 3). These included toileting aids, including raised toilet seats and handles, which had often been provided by local authority agencies, and were generally found to be useful. Occasionally, such products were not accepted due to poor aesthetics, comfort or ease of use. The cohort indicated interest and willingness to make future changes that would improve their safety with regard to falling. In some instances, individuals 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.

However, a smaller proportion of the sample reported having made previous
changes to their behaviour (38%). Examples of these included changes to speed of movement, and use of walking aids. These changes were all reported to be due to physiological deterioration in mobility, strength, balance and coordination.

At the time of the initial interview, just under half (44%) of the sample reported that they would continue to make further changes to their environment with regard to falling. These included the fixing of (additional) grab rail on stairs and at doorways, the installation of a downstairs toilet, stair lift, or additional phone line, and the redesign of a bathroom, e.g. walk in shower/bath, installation of a shower, or a garden for easier maintenance. Additional suggestions that were reported included the relocation to a bungalow dwelling, and the refitting/relocation of light switches to improve lighting options. One percent of the sample reported that they would consider making behavioural changes in the future due to fall risk. Suggestions included the removal of clutter, the adoption of an exercise regime to improve health and fitness, and the employment of a gardener or 'handyman' to undertake particular 'risky' tasks.

A year later (chapter 5), the majority (92%) of individuals reported having changed an aspect of their behaviour since the home interview due to fear or 'concern' about falling.

Qualitative responses highlighted reported changes which included 'trying not to hurry' and 'trying not to leave clutter lying about', although the category with the highest frequency was that of 'take more care generally', with just under one half of all responses. This unspecific response for half of the cohort could indicate that some participants had not actually made changes, but simply wanted to appear acquiescent to compliance and behavioural change. Due to the design of the study (e.g. telephone interviews) it was not possible to see if this is translated into actual practice. This is commented upon in 8.3.

The 37% of individuals who initially reported (during the home interview) that they would continue to make changes to their behaviour additionally reported
types of changes in an unspecific manner. Although positive, they tended to be vague; only 5% of respondents gave specific examples of changes that they would make. Again, this has implication for actual practice and validity of responses (8.3). However, these responses could suggest that a proportion of participants were receptive to change, but that these older people were not entirely definite about the steps they could put in place to reduce fall risk as they become older and/or less able. This argument could be endorsed with the responses examining the reasons for not making any further changes: 50% of these individuals could not think of any further changes they could make to their behaviour, with the remainder of this sub group responding that changes to their behaviour were “unnecessary” or “pointless”. It could be suggested from these findings that an ongoing process of education should play a role in enlightening older people at risk of falling about the issues and the steps they can make, in order that they know what they are able to do as they get older.

**Barriers and facilitators to change in fall prevention**

It was interesting to note that many of the participants reported that they would change their behaviour if they had a fall accident. From anecdotal evidence (chapter 4), this appeared to be dependent on the experience, confidence and personality of the individual concerned and the extent of the incident. These findings are supported by the concepts of behavioural decision theory (Wells and Evans 1996). However, statistical tests could not confirm differences between the fall related behaviours or physical abilities of individuals who fell and those who did not during the notification period (chapter 5). Using larger sample sizes, studies have shown correlations between frailty and health status, and fall history (Wild et al 1981; Nevitt et al 1989; Campbell et al 1997; Davies et al 1999).

Although participants were often able to appreciate and understand hazards, they also sometimes needed to be brought to their attention first. A prerequisite, for change therefore, is awareness that there is a problem in the first place. Responses from the cohort suggest that older people are willing to listen to and accept advice, and eager to learn how to minimize the likelihood
of injuring themselves. A strong desire to maintain independence and autonomy appear to work in favour of this. The factor that resulted in individuals giving up activities and behaviours that were perceived as 'risky' was dependent on their experience, confidence and personality. For example, according to some individuals who were still happy to ascend ladders, they would stop doing it only after they had experienced a 'close call', and would therefore use their 'common sense'. This again relates to behavioural decision theory which explain how various biases and heuristics affect people's perception of risk (Wells and Evans 1996). 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%). This emphasises the importance that some older people place on their continued ability into older age and the worth of self-autonomy. Therefore, it is perhaps not surprising that from discussions it seems many of the sample still persist in risky behaviour, although they understand the risks that they are taking.

There were some product design related barriers to environmental modification amongst the sample. Poor compliance with the use of prescribed walking aids to help mobility; walking aids were often reported to be unsuitable for use in the home environment, due to the changes in floor surface and texture, and limited room for manoeuvre, predominantly for 'zimmer frame' type appliances. Furthermore, there was a significant stigma associated with their use, which added to non-compliance. This is a previously reported problem (Easterbrook et al 2001), although it does not appear that anything has been done in the interim to examine and improve design principles. The difficulty in storage of these aids was another problem raised in relation to falling and tripping. The use of fall (pendant) alarms was generally regarded by the sample as a good idea, particularly for people living on their own, although this often did not translate into actual usage. Problems were reported with these products including comments that, 'they get in the way', 'they're uncomfortable to wear', and 'only old people wear them'. A barrier that was reported regarding clutter and objects left on the floor and the
resultant trip hazards, was that of difficult to access storage space. This included cupboards that are too high to reach, and a lack of general storage space, resulting in objects being left on the floor, particularly if an occupant had moved into a smaller property than lived in previously.

These findings do not suggest that there are any straightforward answers for removing barriers for fall risk. Initial ideas include the investigation of older people’s use of walking aids and the suitability of such equipment to the environment in which they are used. Additionally, general awareness raising may assist, as well as improvements in the aesthetic design of products. These findings also suggest that despite many risk factors for falling in the home being apparent to older people, this awareness does not necessarily influence how they behave in practice.

8.2.5 Health practitioners’ views of fall risk and intervention tools
The final objective of the thesis was to collect the views of health practitioners regarding fall risk and intervention strategies. This approach is novel to the falls health care sector and a review of the medical literature found only limited studies addressing stakeholder opinions (Hughes 2002). The results of quantitative rating scales (chapter 6) demonstrate that there is wide and contradictory opinion amongst different groups of health professionals and differences from the perceptions of the wider literature. However, behavioural risk factors and behavioural intervention measures were both rated as highly significant by respondents in the understanding and prevention of falls among older people. It is uncertain how representative these data are and it is unknown as to whether these opinions are longstanding amongst these disciplines. The constitution of the sample (e.g. relatively few medics) may have predisposed the average responses towards a positive behavioural bias. Alternatively, it is difficult to understand why behaviour has not been previously investigated as a risk factor in falls and as an area with scope for modification: medics are the key contributors to guidelines on fall prevention (e.g. NSFOP, DoH 2001; AGS/BGS collaborative, AGS 2001), their recommendations often being founded only by the results of randomised
control trials (AGS 2001; Gillespie et al 2003) and standard quantitative outcome measures (e.g. fall rate, fall severity). It is understandable that if the policymakers and guideline writers are concentrating on this type of work, then behavioural factors will have been ignored as no large scale trial has been conducted to investigate behaviour and behavioural intervention.

Additional qualitative information described some of the key factors that were perceived as conflicts in the prevention process. Key issues included lack of time and resources, poor compliance by older people, and poor education and health promotion.

It was felt that fall intervention strategies should include health promotion and education targeted at older people and carers of older people, which should be particularly directed towards increasing the understanding of fall risk. It was anticipated that this increased understanding would lead to increased perception of risk, compliance and adherence to intervention strategies, and reduced fall risk. It was reported that improved education should be made available regarding simple techniques that older people can use to improve quality of life if experiencing falls, e.g. minor environmental modifications. It was also flagged that in order for fall intervention strategies to work at their optimum, health and medical professionals need to be aware of the pathways and processes and to work in a more joined up manner. This has been suggested in a previous study examining fall prevention and the NSFOP (Hughes 2002). These problems could be overcome with additional induction and ongoing training for all professionals concerned (Morse 1997).

8.2.6 Realisation of universal research aim
The overlying aim of the research was to examine how behaviour contributes to falls among older people in and around the home. It is propositioned that behaviour has an impact on the established fall risk factors in the literature (Close et al 1999; AGS 2001; Lord et al 2001; Masud and Morris 2001; Scott et al 2001) and on the additionally implied risk factors from this study (e.g. house design), and vice versa. Furthermore, it is apparent that behaviour is a
key risk factor for falling and has an impact on all the other categories of risk factors.

The scale of behaviour in fall risk
It was reported that extrinsic factors were the primary cause in 25%-44% of falls that occurred among the sample population (chapters 4, 5). Behavioural factors were attributed as the main cause of falls in the context of multicausal events on 33%-35% of occasions and intrinsic factors in 18%-42% of cases. It was apparent that behavioural risk factors may have been major contributors to the falls amongst this sample population. Behaviour was a primary contributory factor in one third (33%) of all reported falls (chapter 5) and rushing alone was reported to be causal in 28% of fall incidents. The most common combinatory issues were rushing coalesced with tripping over an object, which accounted for 13% of incidences. The types of behaviour and the issues for fall risk are summarised in Table 8.1.

Behaviour contributing to fall risk
The studies in this thesis demonstrate again (after Lord et al 2001; Gillespie et al 2003) that there are many complex interactions occurring, which have been summarised simply in Figure 8.1. An individual may choose to move about their home in a way that increases fall risk. Additionally, they may choose to design and keep their home in a certain way, or impose an option on themselves that affects their personal limitations. These choices may be due to a lack of awareness of their personal limitations and failure to adjust their behaviour accordingly. However, it appears that these behaviours are all dependent on physical and psychological health, fall history, socio-economic status, pressure and support from family and health professionals, and product and equipment interaction. An individual's behaviour affects an individual's psychological perspective, physical and mental capabilities, and environmental and peripheral influences, each of which in turn have an impact on behaviour and on each other.
Table 8.1 Behaviour and the issues for fall risk

<table>
<thead>
<tr>
<th>Behaviour attributed to fall risk by older people</th>
<th>Issues for risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrying items around the home</td>
<td>• Obscured visual field</td>
</tr>
<tr>
<td></td>
<td>• Impaired balance / stability</td>
</tr>
<tr>
<td>Keeping of pets in the home</td>
<td>• Increased trip hazards present – pet and pet associated items</td>
</tr>
<tr>
<td></td>
<td>• Pets serving to distract owner</td>
</tr>
<tr>
<td></td>
<td>• Owners hurrying to attend to them</td>
</tr>
<tr>
<td>Housework / cleaning</td>
<td>• Increased trip hazards present</td>
</tr>
<tr>
<td></td>
<td>• Impaired balance / stability during reaching / bending / lifting tasks</td>
</tr>
<tr>
<td>Hurrying around the home</td>
<td>• Increased probability of slipping or tripping due to lack of concentration and high speed</td>
</tr>
<tr>
<td></td>
<td>• Increased risk of impaired balance / stability</td>
</tr>
<tr>
<td>Gardening activities</td>
<td>• Increased slip and trip hazards present</td>
</tr>
<tr>
<td></td>
<td>• Increased risk of impaired balance / stability</td>
</tr>
<tr>
<td>Home maintenance</td>
<td>• Falling from height (e.g. from a stepladder or when standing on a chair)</td>
</tr>
<tr>
<td></td>
<td>• Increased risk of impaired balance / stability during reaching / bending tasks</td>
</tr>
<tr>
<td></td>
<td>• Use and provision of lighting</td>
</tr>
<tr>
<td></td>
<td>• Design layout of home</td>
</tr>
<tr>
<td>Leaving items on the floor (clutter)</td>
<td>• Slip and trip hazards present</td>
</tr>
<tr>
<td>Use of medications</td>
<td>• Side effects, including dizziness and drowsiness, impaired vision, effects on balance</td>
</tr>
<tr>
<td>Use of spectacles and unattended vision</td>
<td>• Impaired vision implicating increased risk of trip or slip</td>
</tr>
<tr>
<td>Use of walking aids</td>
<td>• Acting as a trip hazard</td>
</tr>
<tr>
<td></td>
<td>• Handling bulky item</td>
</tr>
<tr>
<td>Use of (certain) footwear</td>
<td>• Increased risk of slipping (when wearing footwear with slippery soles)</td>
</tr>
<tr>
<td></td>
<td>• Increased risk of tripping (when wearing insecure footwear)</td>
</tr>
<tr>
<td></td>
<td>• Impaired balance / stability (when wearing heeled footwear)</td>
</tr>
<tr>
<td>Use of (certain) clothing</td>
<td>• Trip hazards present (when wearing loose bottomed trousers or long skirts)</td>
</tr>
</tbody>
</table>
Figure 8.1 Influences affecting older peoples' risk of falling in the home
8.3 Critique of research methodology

A triangulated, systems approach was used for the research. The use of any one method can, arguably, produce results of weaker validity than a combination of methods. Using different methods and sources helps to address this problem, and can strengthen belief in the validity of the observations (Dekker 2002). The process of triangulation during chapters 3-5 increased data validity and enabled verification of one set of data against data from another collection method.

This approach helped to offset some of the detrimental factors of methodological design: generally for the triangulated methods, the sample sizes were small and the participants could have been more representative of the general older population in terms of age, socioeconomics and type of accommodation lived in. Therefore, the information obtained from the sample may have been more representative of the behaviours and activities of a 'younger' older population. This may mean that information on difficulties older people endure with tasks and the environment and types of falls that older, frailer individuals sustain, may be absent. Therefore, it should be surmised that the data collected in chapters 3-5 is representative only of a sub-population of older people. These issues could be rectified by undertaking a larger epidemiological study to examine behaviour and fall risk. It may also have been useful to use additional data collection tools including measures of quality of life and self efficacy. Using these standard tools would have allowed the data to be compared to standards published in the wider literature.

A good rapport was built up between the researcher and the cohort of older people. It is anticipated that these relationships helped with the data collection and recruitment. It is possible, however, that participant responses may have been focussed towards giving the researcher a more positive view of fall risk perception and general behaviour and therefore biased towards what older people thought the researcher wanted to hear. Additionally, the
rapport may have resulted in researcher subjectivity in results interpretation of qualitative data.

It is also important to mention the researcher's evolution of knowledge and understanding of geriatric medicine and fall issues over the course of the 2-year data collection period (chapters 3-5). Little experience at the beginning may have had a positive impact on removing bias for causal contribution and encouraging the researcher to ask more questions for a more detailed response. However, some aspects of data capture may have been missed (e.g. in the focus groups and early interviews) due to a lack of experience of the topic, although this should have been allayed in the interviews as proforma were used.

Retrospective data collection (chapters 3-4) can not be relied upon to produce the most reliable of information due to issues with recall and memory. However, the information gathered in these chapters was built upon and validated in chapter 5 with the use of a prospective survey. When asking individuals what they thought contributed to the falls that they had sustained, they might not have been able to identify precisely what had happened and reported what they 'thought' had happened. This may have distorted the data set in some way. Therefore, for such qualitative data collection, the responses have to be interpreted carefully and cannot be completely relied upon. The lack of specific responses for half of the cohort when asked about behavioural changes they may have made, could have indicated that some participants had not actually made changes, but simply wanted to appear acquiescent to compliance and behavioural change. Additional and more accurate information may have been obtained by conducting home visits and interviews with the participants rather than telephone interviews. This could have facilitated individuals talking through exactly what happened when they fell and to see if reported behaviour was translated into actual practice. This was, however, not possible with the remit of this study and the time and resources involved.
The questionnaire survey with health professionals was limited in size and a greater participation rate may have induced higher quality data of a greater breadth. As with any similar data collection tool, the data collected is only as good as the information that participants share. It would have been useful to interview health professionals and to study them at work in fall prevention roles. With hindsight, the method could have focused on key areas that resulted from the findings, e.g. compliance and barriers to fall prevention schemes. The results were interesting and useful as an indicator for the population that participated. However, the findings should be taken in view of these limitations.

The investigation of the use of the transtheoretical approach was exploratory and the issues raised from the study should be treated as such. Due to the way in which the research area developed, the discipline of health psychology was not investigated until a late phase, hence the retrospective application of the tool. Of course, the application could have been more successful if it had been taken into consideration earlier on in the research, but this is the nature of the development of a thesis. Further work will be able to investigate this area more substantially.

Having taken into account the limitations of the study the research should be treated as indicative rather than conclusive.

8.4 Contribution to knowledge

As discussed previously, the role of health related risk factors for falling has been examined in detail in many studies (Tinetti et al 1988; Cwikel et al 1990; Campbell et al 1989; Davis et al 1999; Masud and Morris 2000). This thesis adds to these initial foundations but also offers new perspectives. These include suggestions on additional intrinsic risk factors (psychological and mental capabilities, peripheral issues), extrinsic risk factors (design of products and the home environment) and behavioural risk factors that affect falls. A wide ranging search of the literature found no other investigations of
falls among older people giving detailed examination of the contribution of behaviour in the home.

The major contribution to knowledge by this thesis, is the provision of data regarding behavioural risk, and the interaction of behavioural risk with other existing risk factors, in falls sustained by older people. New and detailed information has also been provided regarding the use and design of assistive aids and devices and the implications for falls. Previously unreported aspects of home environment design have been raised as core factors in fall risk. Attention has been given to examine the knowledge and attitudes of older people and health professionals about factors affecting fall risk and fall prevention and barriers to fall prevention. This again, is unexplored territory and the findings are useful and interesting exploratory contributions to knowledge.

As this work is of a detailed nature, it also offers up to date, comprehensive information on fall characteristics such as location, type, injuries sustained, and new information on proportion of risk and categories of falls, for a small cohort of older people.

The contribution of health psychology frameworks to understanding fall related behaviour among older people has been examined, which is a new and novel approach to the problem.

The way in which this thesis has adopted a systems approach to investigate the issues and, hence, uncovered aspects of the risk factor interactions that have not previously been described, adds further to the knowledge in the field. Additionally, previous work investigating fall risk factors has been undertaken in an isolated fashion with little use of holistic thinking or of a wider systems approach. When examining such obviously inter-related factors, it is perhaps surprising that a more instinctive approach has not been used in earlier studies.
Furthermore, a triangulated approach combining the use of qualitative and quantitative data collective has been undertaken which is extremely rare in this medical field of research.

Therefore, this research adds new data and suggestions to both geriatric and ergonomics literature.

8.5 Directions for future research

This research has raised many questions that have not been possible to address in the scope and timescales of this thesis. This section profiles potential avenues for future research.

This thesis has identified important behavioural factors which affect the risk of older people falling in the home. It has been found that health beliefs and subsequent behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, reducing confidence and increasing fear of falling (McKee et al 2002). One research need might be for further epidemiological studies, with larger samples, to confirm these tentative findings.

Relative to the attention paid to understanding the causes of falls, little information exists on: adherence to such falls prevention strategies; or the barriers which may inhibit the effective delivery of such strategies. This thesis has connected with the reported barriers which inhibit adherence to interventions. Broadly, barriers appear to fall into one of three categories: organisational issues (i.e. difficulties implementing risk-reduction strategies); adherence issues (i.e. the interventions are supplied, but adherence by clients is poor); and sustainability issues (i.e. the intervention lacks the sustainability necessary to have an optimal impact on falls prevention) (Close 2001).

By systematically identifying barriers to effective service delivery, and by developing a model of falls-prevention best practice, both components of
Standard 6 of the NSF can be addressed (DoH 2001): to 'reduce the number of falls which result in serious injury'; and to 'ensure effective treatment and rehabilitation for those who have fallen'. Specifically, and in line with NSF recommendations, a study could aim to promote optimal working partnerships between NHS, local authority and voluntary providers and supply high-quality information to practitioners, enabling service providers to anticipate and overcome those factors which diminish the impact of falls prevention programmes. Working with social service and health providers and patient and caregiver groups, it is the expectation that a study would make a substantial contribution to the development of Falls Care Pathway model of service provision.

The theme of older people’s resistance to fall interventions and the preceding barriers, e.g. non-compliance with advice from health professionals, compliance with medication regimen, eliminating home safety hazards, etc. warrants further attention.

Interventions aimed at reducing falls are likely to be most effective if they recognise both individual and organisational barriers (and facilitators) to change and are designed appropriately to overcome them. Older people and health professionals have a crucial input to make in determining which programmes will work and which will not. A future study should develop, implement and evaluate falls interventions more closely matched to user requirements (examining the use of models from health psychology) and therefore more likely to facilitate compliance.

Another unanswered question from this research is whether raised awareness among older people translates into safer practice and ultimately reduced number of falls. As well as investigating this further, it would be interesting to examine further the role of education and health promotion in changing older people’s attitudes and fall risk beliefs including the types of messages that need to be conveyed and materials that could be successfully employed. Various types of materials are available to educate older people (and their carers) about fall risk. However, it was indicated in the findings of this thesis
that materials could be more adequate and more appropriate. Little has been done to investigate educational approaches to falls (Gillespie et al 2003) and these qualitative findings emphasise this missing information. Further information is required regarding the suitability of educational materials and the impact of these materials on perception of fall risk.

8.6 Final conclusions
Falls are an extensive problem, with the scale of this set to worsen in line with the increasing older population. Risk factors for falls have received much attention during recent years, although little emphasis has been given to the role of behaviour in falls risk. It is argued in the thesis that older people play an active role in their exposure to risk, influenced by their attitudes, beliefs and motivations. It is clear from the research that there are many situations where the decisions and actions of older people affect their risk of falling. It is argued that confronting the problem of older people falling in the home requires a holistic, ergonomics approach, which addresses design and behavioural factors as well as medical and health issues. Falls are a multifactorial problem and need a multifactorial response. The research has identified opportunities to reduce the risk of falls among older people, both with respect to behaviour, and the design of products and buildings. The research has also highlighted that there is potential to improve practice and processes at all levels of fall prevention, particularly with respect to increased understanding for design and delivery of intervention strategies. Most importantly, the investigation has established that there is a need to raise awareness of the problem and provide practical fall prevention advice, whilst using a participatory approach with older people as key stakeholders.
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Appendix A

Short questionnaire distributed to participants at the end of the focus group sessions.
Falls in the Home & Garden: General Questionnaire

The contents of this questionnaire are strictly confidential and will only be seen by members of the research team. However, anonymous excerpts may be used when the results are published.

Name: ___________________________ (BLOCK CAPITALS)

Date of Birth: ____________________

Today's Date: ____________________

Please tick ☑ the type of home you live in:

☐ Detached ☐ House

☐ Semi-detached ☐ Bungalow

☐ Terraced ☐ Flat

☐ Other (please explain) ________________________________

Does your home have a garden/yard?

☐ Yes ☐ No

Approximately how old is your property? ____________________ Years

Does your property have a flight of internal stairs?

☐ Yes ☐ No

Does your property have any other stairs or steps, in the house or in the garden?

☐ Yes ☐ No

At present, are you taking any medication?

☐ Yes ☐ No

Have you had a fall in the home or garden?

☐ Yes ☐ No
Falls in the Home & Garden: Specific Falls

Please use a separate form for each accident.

We are interested in any slips, trips or falls you may have had in your home or garden, or in the home or garden of friends or relatives, that have occurred in the last 12 months. Please tell us about any slips, trips or falls that you have had, whether you hurt yourself or even if you just had a near miss.

In whose home did the fall happen?

- Own home
- Home of a friend or family member
- Other

Specify other: ...........................................................................

Approximately how long ago did it happen?

What time of day did it happen?

- Morning (6am until 12 noon)
- Afternoon (12 noon – 5pm)
- Early evening (5pm - 8pm)
- Late evening / during the night (8pm – 6am)
- Cannot remember
Can you describe what happened?

1. 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
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?  
Yes  No

• If 'Yes', please explain below:


Thank you for your time!
Appendix B

Home interview survey proforma:

- Information Sheet for Participants
- Participant Informed Consent
- Participant Information Questionnaire
- Behaviour in the Home Questionnaire
- Modifications Made to the Home Environment Questionnaire
- Fall History Questionnaire
- Ability to Carry Out Daily Activities Questionnaire
- Physiological Measurements
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.
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
Participant Information Questionnaire

About you:
Date of birth................................. ...
M/F ................................................... ...

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

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

366
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?

<table>
<thead>
<tr>
<th>Type</th>
<th>Y/N</th>
<th>Prescribed?</th>
<th>Date prescribed?</th>
<th>When are they worn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bifocals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multifocals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported problems with current glasses:

<table>
<thead>
<tr>
<th>Can't see TV</th>
<th>Can't read book</th>
<th>Can't see distances</th>
<th>Problems all the time</th>
</tr>
</thead>
</table>

Which pair of glasses do they wear for this activity?

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?

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td></td>
</tr>
<tr>
<td>Around the house</td>
<td></td>
</tr>
<tr>
<td>Long distances</td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td></td>
</tr>
<tr>
<td>All the time</td>
<td></td>
</tr>
</tbody>
</table>

Describe the problems you have with your eyes?

Do you have any conditions that affect your vision?

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataracts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glaucoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macular degeneration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour vision defect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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?
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?

1  2  3  4  5
Not at all  A little  Reasonably  A lot  Greatly

Do you use step ladders?  Yes  No

How often do you use them?

1  2  3  4  5
Never  Rarely  Sometimes  Often  Always

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

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

1  2  3  4  5
Not at all  A little  Reasonably  A lot  Greatly

371
Do you do any DIY?  

| Yes | No |

How often?

| 1 | 2 | 3 | 4 | 5 |

- Never
- Rarely
- Sometimes
- Often
- Always

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

---

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

| 1 | 2 | 3 | 4 | 5 |

- Not at all
- A little
- Reasonably
- A lot
- Greatly

Do you do any gardening?  

| Yes | No |

How often do you do this?

| 1 | 2 | 3 | 4 | 5 |

- Never
- Rarely
- Sometimes
- Often
- Always

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?

| 1 | 2 | 3 | 4 | 5 |

- Not at all
- A little
- Reasonably
- A lot
- Greatly

372
Do you clean the home yourself?  
How often do you do this?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Reasonably</td>
<td>A lot</td>
<td>Greatly</td>
</tr>
</tbody>
</table>

Do you ever leave things on the floor (clutter, shoes)?  
How often do you do this?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

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

I'm tidy
It's dangerous
Other:

373
How do you think that leaving objects on the floor affects your chances of having a fall?

1 2 3 4 5
Not at all A little Reasonably A lot Greatly

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?

1 2 3 4 5
Never Rarely Sometimes Often Always

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

1 2 3 4 5
Not at all A little Reasonably A lot Greatly
Personal Living

Do you use a walking aid? Yes No

How often do you do this?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Reasonably</td>
<td>A lot</td>
<td>Greatly</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

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?

1 2 3 4 5

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Reasonably</td>
<td>A lot</td>
<td>Greatly</td>
</tr>
</tbody>
</table>

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?

1 2 3 4 5

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

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

1 2 3 4 5

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Reasonably</td>
<td>A lot</td>
<td>Greatly</td>
</tr>
</tbody>
</table>
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?

1 2 3 4 5

Never  Rarely  Sometimes  Often  Always

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

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

1 2 3 4 5

Not at all  A little  Reasonably  A lot  Greatly

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?

377
How do you think drinking affects your chances of having a fall?

1  2  3  4  5
Not at all  A little  Reasonably  A lot  Greatly

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?

1  2  3  4  5
Not at all  A little  Reasonably  A lot  Greatly

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?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not at all</td>
<td>A little</td>
<td>Reasonably</td>
<td>A lot</td>
<td>Greatly</td>
</tr>
</tbody>
</table>

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)*
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?
<table>
<thead>
<tr>
<th>Do you use any of the following?</th>
<th>Would you use one?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Fall alarm (explanation)</td>
<td>☐</td>
</tr>
<tr>
<td>Why?</td>
<td></td>
</tr>
<tr>
<td>Hip protector (photo)</td>
<td>☐</td>
</tr>
<tr>
<td>Why?</td>
<td></td>
</tr>
<tr>
<td>Bath hoist</td>
<td>☐</td>
</tr>
<tr>
<td>Why?</td>
<td></td>
</tr>
</tbody>
</table>

382
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?
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
- Home of a friend or family member
- Other

Specify other: ...........................................................

Approximately how long ago did it happen?

What time of day did it happen?

- Morning (6am until 12 noon)
- Afternoon (12 noon – 5pm)
- Early evening (5pm – 8pm)
- Late evening / during the night (8pm – 6am)
- Cannot remember
Can you describe what happened?

2. 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?  
- 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?

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?
Ability to Carry Out Activities of Daily Living Questionnaire

Please rate your ability to do the following activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>I can do alone without difficulty</th>
<th>I can do alone but with difficulty</th>
<th>I can do but need help or assistance</th>
<th>Unable to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathing / showering</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Dressing</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Cooking</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Walking within the home</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Light housework</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Heavier housework, eg washing windows &amp; floors</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Climb one flight of stairs</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Shopping</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

(Please cross one box per activity)
### Physiological Measurements

**Weight. (KG)**

**Current Height (mm)**

**Size of shoe**

**Grip strength test. (Kgf)**

<table>
<thead>
<tr>
<th>Right Hand Grips</th>
<th>Left Hand Grips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Time for right leg.</th>
<th>Other comments</th>
</tr>
</thead>
</table>

| Time for left leg. |

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°.

<table>
<thead>
<tr>
<th>How well do you think you will do?</th>
<th>How actually did:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to do without difficulty</td>
<td>□</td>
</tr>
<tr>
<td>Able to do, but experienced some difficulty</td>
<td>□</td>
</tr>
<tr>
<td>Able to do, but experienced a lot of difficulty</td>
<td>□</td>
</tr>
<tr>
<td>Unable to do</td>
<td>□</td>
</tr>
<tr>
<td>Decided not to attempt</td>
<td>□</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Line 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 2:</td>
</tr>
<tr>
<td>Line 3:</td>
</tr>
<tr>
<td>Line 4:</td>
</tr>
<tr>
<td>Line 5:</td>
</tr>
<tr>
<td>Line 6:</td>
</tr>
<tr>
<td>Line 7:</td>
</tr>
</tbody>
</table>

Repeat test with glasses on:

<table>
<thead>
<tr>
<th>Line 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 2:</td>
</tr>
<tr>
<td>Line 3:</td>
</tr>
<tr>
<td>Line 4:</td>
</tr>
<tr>
<td>Line 5:</td>
</tr>
<tr>
<td>Line 6:</td>
</tr>
<tr>
<td>Line 7:</td>
</tr>
</tbody>
</table>

Comments
Appendix C

Fall notification scheme proforma:

• Thank you letter and invitation to continue participation in fall notification scheme.
• Fall notification scheme notification postcards
• Fall notification scheme telephone interview
• Fall notification scheme final semi-structured telephone interview
Dear <First name>,

Avoiding Slips, Trips and Broken Hips

Thank you very much for giving me your time and taking part in our research.

In an attempt to find out the causes of fall accidents in the home and garden (including the stairs) we would like to monitor and record the circumstances of any slips, trips or falls that you may have over a 12 month period (between now and Dec 2001). This method of data collection allows us to collect accurate information about the causes of slip, trip and fall accidents in the home and garden. We are interested in any incident regardless of whether you sustain an injury.

Enclosed is a consent postcard. Please could you return this straight away in the FREEPOST envelope provided, indicating if you are willing to take part in the study. Also enclosed are 3 slip, trip and fall notification postcards. If you are unfortunate enough to have a slip, trip or fall in the home or garden, please could you complete a postcard as soon as possible after the accident has occurred and send it to me. I will then contact you by phone to discuss with you the circumstances leading up to the accident. Alternatively, you can telephone me on the number above and I will call you straight back to chat with you about what happened.

If you have any questions about this study or know anyone who would be willing to be interviewed at their home with regard to falls, please do not hesitate to contact me at the above address.

Many thanks for your continued interest in this research.

Kind regards

Charlotte Brace
Research Associate
Health & Safety Ergonomics Unit
Please use this card if you experience a slip, trip, or fall anywhere in your home or garden.

Either:
Telephone Charlotte Brace on 01509 228485
Or

Return this card in the FREEPOST envelope provided (no stamp required)

Charlotte will then call you back and chat to you about the circumstances of the slip, trip or fall.

*Many thanks for your time and interest.*

Name .................................................................

Signature ............................................ Date .........................

---

Slip, Trip, or Fall Notification Card

Please use this card if you experience a slip, trip, or fall anywhere in your home or garden.

Either:
Telephone Charlotte Brace on 01509 228485
Or

Return this card in the FREEPOST envelope provided (no stamp required)

Charlotte will then call you back and chat to you about the circumstances of the slip, trip or fall.

*Many thanks for your time and interest.*

Name .................................................................

Signature ............................................ Date .........................
### Fall Notification Scheme: Question Prompts

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Faller</td>
<td></td>
</tr>
<tr>
<td>ID code</td>
<td></td>
</tr>
<tr>
<td>Today's date</td>
<td></td>
</tr>
<tr>
<td>Date of fall</td>
<td></td>
</tr>
<tr>
<td>What happened?</td>
<td></td>
</tr>
<tr>
<td>How? Why? Where?</td>
<td></td>
</tr>
<tr>
<td>Footwear?</td>
<td></td>
</tr>
<tr>
<td>Walking Aid?</td>
<td></td>
</tr>
<tr>
<td>Medical/health factors?</td>
<td></td>
</tr>
<tr>
<td>Other contributing factors?</td>
<td></td>
</tr>
<tr>
<td>Weather conditions, temperature...</td>
<td></td>
</tr>
<tr>
<td>Injuries?</td>
<td></td>
</tr>
<tr>
<td>Treatment?</td>
<td></td>
</tr>
<tr>
<td>Recovery time?</td>
<td></td>
</tr>
<tr>
<td>Lessons learnt?</td>
<td></td>
</tr>
<tr>
<td>Any other comments?</td>
<td></td>
</tr>
</tbody>
</table>
## Fall Notification Scheme: Final Interview

To be competed for each participant, after reading his or her data set.

<table>
<thead>
<tr>
<th>Name of Faller</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ID code</td>
<td></td>
</tr>
<tr>
<td>Today’s date</td>
<td></td>
</tr>
<tr>
<td>Any (other) falls (other than those the researcher has previously been alerted to) since home visit?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**If yes, complete further Fall Notification Assessments as required**

<table>
<thead>
<tr>
<th>Since my visit, have you:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>- felt more aware of the risks of falling?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- taken more care when in your home?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>- changed the way in which you move around your home?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>- changed the way in which you carry out activities of daily living?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Any other comments? |  |  |
Appendix D

Questionnaire to health professionals at falls conferences.
We are interested in your opinions on falls and their prevention.

Please give your current role, e.g. GP, physiotherapist, home carer, etc.

Please indicate approximately how many years you have been working in this role.

Please give your current work environment, A&E, care home, etc.

Please rank the following in order of importance, based on your experience: what do you think are the main causes of falls among older people?

Please enter ‘1’ as the most important cause, ‘2’ as the next most important cause, and so on.

<table>
<thead>
<tr>
<th>Example (for illustration only)</th>
<th>Your Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (least important)</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>1 (most important)</td>
<td>10</td>
</tr>
</tbody>
</table>

Please rank the following in order of success, based on your experience: what do you think are the most successful methods of preventing falls and injuries from falls, among older people?

Please enter ‘1’ as the most successful method, ‘2’ as the next most successful, and so on.

<table>
<thead>
<tr>
<th>Example (for illustration only)</th>
<th>Your Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 (least important)</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>1 (most important)</td>
<td>9</td>
</tr>
</tbody>
</table>

Other (please specify)
Your experience as a health professional, what do you think are the problems in trying to reduce falls among older people? Please rate the following, by circling the number you feel represents your opinion:

<table>
<thead>
<tr>
<th>No problem at all</th>
<th>Significant problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Older people are set in their ways and won’t heed my advice</td>
</tr>
<tr>
<td></td>
<td>Insufficient time or money is available to support my activities</td>
</tr>
<tr>
<td></td>
<td>Lack of commitment from my colleagues</td>
</tr>
<tr>
<td></td>
<td>Lack of commitment from my superiors</td>
</tr>
<tr>
<td></td>
<td>Insufficient materials (e.g. leaflets) available to give to older people</td>
</tr>
<tr>
<td></td>
<td>Inadequate materials available to give to older people</td>
</tr>
<tr>
<td></td>
<td>Falls occur largely by chance and are difficult to prevent</td>
</tr>
<tr>
<td></td>
<td>Other (please specify)</td>
</tr>
<tr>
<td></td>
<td>Other (please specify)</td>
</tr>
</tbody>
</table>

Please add any other comments you may have about falls among older people, their prevention, or their causes:

Thank you for your time.

Please post this form in the Expert Consultation Response Box by the Registration Desk.

Alternatively, please send to Charlotte Brace, FREEPOST, Department of Human Sciences, Loughborough University, LEICS LE11 3TU

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Appendix E

Published papers related to work reported in the thesis:


REDUCING FALLS IN THE HOME AMONG OLDER PEOPLE
– BEHAVIOURAL AND DESIGN FACTORS

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

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

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. The research reported in this paper addresses this problem, while also giving consideration to the practicalities of everyday living for older people. Interviews were conducted with 177 community dwelling people from 150 households, representative of the UK population (aged 65+). The study has highlighted many behavioural and design factors involved in fall risk. These include footwear, walking aids, storage, use and design of domestic products in combination with behaviour such as hurrying, carrying objects, and keeping pets. Reducing falls in the home among this population requires a holistic approach, with attention both to design and behaviour.

Introduction

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 HASS data reveal that in 2000, 330,000 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, 2001). This does 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 a high prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a relatively mild fall particularly dangerous (Josephson et al, 1991).

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

There are numerous risk factors in falling. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls. Extrinsic factors are environmental hazards that present an opportunity for a fall to occur. Individual fall incidents are generally multifactorial.

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 fall history, previous falls, length of lie on floor/ground surface, range of activities of daily living, and degree of social interaction and support (Nelson and Amin, 1990; Tideksaar and Kay, 1986).

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).

Previous research (Hill et al., 2000; Haslam et al., 2001) has identified important behavioural factors which affect the risk of older people falling on stairs, e.g. rushing, carrying objects. The research reported here is extending this work into other areas of the home.

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. 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.

Issues explored by the interviews included factors affecting risk of falling in the home, embracing age-related aspects and self-perceived safety. The immediate and longer term consequences of having a fall and the value and acceptability of preventative measures were also discussed. The interviews involved detailed discussion of different areas of the home, with regard to specific risk factors, 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.

Interviewees were briefed both verbally and in writing about the study prior to participation. They were informed that the discussions 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 prior to the discussion, to avoid leading responses in any particular direction. Each interview lasted approximately two hours, with all interviews conducted by the same researcher.
Results

Table 1. Participant characteristics (n=177)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age mean (sd)</td>
<td>76 (7.3)</td>
</tr>
<tr>
<td>Range</td>
<td>65-99</td>
</tr>
<tr>
<td>Male</td>
<td>27%</td>
</tr>
<tr>
<td>Female</td>
<td>73%</td>
</tr>
<tr>
<td>Living alone</td>
<td>47%</td>
</tr>
<tr>
<td>Eye sight test in last 2 years</td>
<td>90%</td>
</tr>
<tr>
<td>Use bifocal spectacles</td>
<td>38%</td>
</tr>
<tr>
<td>Have a condition that affects vision (e.g. cataracts, glaucoma, macular degeneration etc)</td>
<td>35%</td>
</tr>
<tr>
<td>Take at least 1 prescribed medication daily</td>
<td>79%</td>
</tr>
<tr>
<td>Take 4 or more prescribed medications daily</td>
<td>23%</td>
</tr>
<tr>
<td>Fallen in home since age 65</td>
<td>48%</td>
</tr>
<tr>
<td>Experienced 2 or more falls in home</td>
<td>21%</td>
</tr>
</tbody>
</table>

Table 2. Household characteristics

<table>
<thead>
<tr>
<th>Property Age</th>
<th>Median Age</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached</td>
<td>23%</td>
<td>3-110</td>
</tr>
<tr>
<td>Semi-Detached</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Terraced</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>Bungalow</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Other types of properties (e.g. bed sit)</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

Behaviour Affecting Fall Risk

Behaviour involving direct use of the home environment, perceived by the participants as affecting fall risk, included: hurrying, aspects of house maintenance (e.g. changing light bulbs, using stepladders, ‘clutter’) and gardening. One of the most hazardous activities was thought to be getting in and out of the bath.

Participants accepted that actions affecting the home environment also affect safety. These included fall risks introduced by occupants, e.g. leaving things on the floor, maintenance and type of floor, use and condition of low lying furniture, and the provision of lighting. Figure 1 illustrates some of these issues. Cohabitation, visitors and pets were also believed by study participants to be factors. Other inhabitants and visitors (including grandchildren) were reported to result in an increase in ‘clutter’, especially unexpected objects, which were not usually present. Pets underfoot and pet items including bowls and toys were also reported as an issue for fall safety, due to tripping. Individual capability affected by behaviour was also discussed as amplifying risk of falling. Inappropriate footwear and spectacles, use of medication, use or non-use of lighting, and a lack of regular exercise were examples of this.

Qualitative evidence on age-related factors thought to lead to increased risk of falling highlighted the negative effects of decreased mobility, reduced balance and strength, and deteriorating vision.

Risk Perception

With regard to self-perceived fall safety, the most perilous areas of the home were considered to be the garden, kitchen, bathroom and stairs, due to the nature of the tasks performed in these places (bending, reaching, etc.) and the environmental hazards present, encompassing changes in level and surface type and texture, slopes, objects left on the floor and rugs.
Fifty eight percent of the home environments visited had been altered in the last 5 years to improve safety with regard to falling. Changes included the use of compact fluorescent (long life) light bulbs, anti-slip mats, grab rails, and low-maintenance garden designs. Participants from 40% of the households had ideas for changes that they wanted to make to their homes in the future to make them safer. These included downstairs toilets, walk in showers, and extra grab rails around the home and garden.

**Product Design and Falling**

The design of some domestic products may contribute to falls, including oven and dishwasher doors that open downwards forming a trip hazard, or cleaning equipment that is heavy and difficult to hold. The design of stepladders was clearly an important issue for many of the interviewees and improved designs would be welcome. Features suggested were an additional high handrail and a tool holding compartment, to reduce the need for continual movement up and down the ladder to fetch items. The design of light shades for ease of removal during bulb changing was another feature that participants felt would be beneficial, and again would ease a task performed off the ground.

Footwear design, especially slippers, was felt to be a factor in fall safety, particularly the quality, thickness, grip and durability of the sole.

Walking aids were often reported to be unsuitable for use in the home environment, due to the changes in floor surface and texture, and limited room for manoeuvre, predominantly for ‘zimmer frame’ type appliances. The difficulty in storage of these aids was another problem raised in relation to falling and tripping.

Fall alarms were generally regarded by the sample as a good idea, particularly for people living on their own, although this often did not translate into actual usage. Problems were reported with these products including comments that, ‘they get in the way’, ‘they’re uncomfortable to wear’, and ‘only old people wear them’.

Building design may also introduce risks. For example, additional 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.

Discussion

This survey has found the risk factors for falling to be widespread, especially with regard to fundamental design features and interviewees' behaviour. This research supports previous suggestions (Hill et al., 2000; Haslam et al., 2001) that despite many risk factors for falling in the home being apparent to older people, this awareness does not necessarily influence how they behave in practice.

In some cases a risk may be recognised, but without behaviour making an allowance for it. For example, some of the interviewees did not, or did not want to, acknowledge that their physical abilities had deteriorated with a decline in health status, and therefore continued with activities regardless of this factor. Unfortunately, it is difficult to say what is the best advice to give to this population. It is important in terms of health, autonomy and independence to remain active for as long as possible in old age; conversely, it is not prudent to advise older people to continue with activities that could be a danger to health and well being. On the other hand, some people are very sensitive to the issue of fall safety and have made modifications themselves to their homes. In some instances, interviewees appear to be ‘ageing gracefully’, by putting in place new mechanisms and methods for completing activities of daily living, and being sensibly cautious in their behaviour.

In other cases, a risk may not be recognized or understood. A lack of awareness of risk 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.

The accuracy of risk perception is also an interesting aspect. For example, interviewees report taking extra care in the bathroom because they think that they are at increased risk of falling there, although, according to HASS data (DTI, 2001), almost twice as many falls occur in the bedroom compared to the bathroom. Few interviewees mentioned the bedrooms as areas of concern for falling.

The serious immediate and long-term implications of having a fall were generally well understood by the sample, due to personal experiences or those of friends or relatives. However, less than 5% of the sample could recall ever seeing or receiving any advice or information about fall safety.

Confronting the problem of older people falling in the home requires a holistic, ergonomics approach that addresses design as well as behavioural issues. The effects of improved building regulations and standards will direct improvements in the design of future housing and the home environment. Improvements in the design of 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 improvements would benefit every user, not just older people.

Conclusions

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. Improvements to
products and the built environment will need to be longer-term initiatives. Meanwhile, there are more immediate measures that can be taken by older people and their carers to improve fall safety. Most importantly, there is a need to raise awareness of the problem and provide practical fall prevention advice.

Acknowledgements

The authors wish to acknowledge the support of the Department of Trade and Industry (DTI) who sponsored this research. The views expressed, however, are those of the authors and do not necessarily represent those of the DTI.

References


BEING LED UP THE GARDEN PATH: WHY OLDER PEOPLE ARE STILL FALLING AT HOME

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

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

Falls in the home are a major problem for older people of which there are many recognised risk factors. A group of older people were interviewed about fall safety and then monitored over the subsequent year. The fall rate amongst the sample was 29%. There were no significant differences amongst the fallers and non-fallers in terms of physical abilities or reported behaviour. However, it was concluded that the design of the environment played a role in the reported falls. Opportunities exist to reduce the risk of older people falling in and around the home, with respect to improved design. If the incidence of falls can be reduced, older people can stay in their homes for longer, whilst enjoying a higher quality of life.

Introduction

Falls among older people are a major health concern. It has been well documented over the years that a third of individuals over 65, and nearly half of those over 80, fall each year (Prudham and Evans, 1981). 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). Fall related incidences are influencing factors in nearly half of the events leading to long-term institutional care in older people (Kennedy and Copard, 1987). Clearly, if the incidence of falls can be reduced, people can live longer, more healthily and more independently in their own homes, with a better quality of life.

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 a high prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a relatively mild fall dangerous.

Over 400 potential risk factors for falling have been identified, which are commonly split into categories of intrinsic and extrinsic risk. However, individual fall incidents are generally multifactorial. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls, e.g. decreased balance ability, disturbed gait, cognitive impairment, reduced strength, impaired vision, illness, and side effects
from use of medication. Research has estimated that intrinsic risk factors play a role in approximately 50% of falls amongst a combined group of institutionalised and community dwelling older people (Rubenstein and Josephson, 1996). Extrinsic factors are environmental hazards that present an opportunity for a fall to occur, including floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting, problems with walking aids and equipment, ill-fitting footwear, sensory surround and feedback (audio and visual), placement of furniture. Although environment-related risk factors are reported to be causal in around 33% of falls, it has only been recently that detailed work has been done to look at the design of some areas of the home environment in relation to older people, falls and independent living (Brace et al., 2002).

Previous research (Hill et al., 2000; Brace et al., In Press) has identified important behavioural factors which affect the risk of older people falling in the home, e.g. rushing, carrying objects; these findings indicate that behaviour contributes to approximately 35% of falls. It has also been found that behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, affecting confidence and fear of falling.

This paper describes how a group of older people, after being interviewed about fall safety, participated in a fall notification scheme over the course of the subsequent year. The relationship between physical abilities, behaviour, and design of the home environment, have been investigated. The paper discusses the falls in terms of type, severity and cause of fall, and how behaviour has changed as a result of these incidences and since the initial interview.

**Method**

Interviews were conducted with 177 older people, aged 65 – 99, in their own homes. Issues explored by the interviews were factors affecting risk of falling in the home including age-related aspects and self-perceived safety. The immediate and longer term consequences of having a fall and the value and acceptability of preventative measures were also discussed. The interviews involved detailed discussion of different areas of the home, with regard to specific risk factors, and the interviewee’s fall history and origin. In addition, standard anthropometric dimensions of interviewees were recorded, along with other measurements of strength, balance and coordination, and vision. The interviewees were monitored over the subsequent year, and all reported falls were recorded using a notification system, quantifying event, behaviour, and location.

Participation was invited for the Fall Notification Scheme immediately after each home interview. Of the original interviewed participants, 156 felt able to participate in the follow up study (86% response rate). Consenting participants were briefed and freepost envelopes and fall notification postcards were distributed. Participants were strongly encouraged to alert the researcher as soon as possible after a fall within the home (or that of a friend or relative), using the postcard or by a free telephone call. A very positive emphasis was given to participants that the researcher was interested in all falls regardless of whether or not an injury was sustained. When alerted, the researcher used an assessment during a telephone interview to illicit all possible information about the fall/s. At six months, personalised reminder letters (including further notification postcards, freepost envelopes and reminder details of the study) were distributed to all participants. At twelve months a semi-structured telephone interview was conducted with
each individual to gather any further/missing fall data and to further investigate changes in fall related behaviour and perceptions of fall risk.

**Results**

**Sample population**
At the end of the year, 69 falls (range 1 – 12, mean 1.57, SD 1.78) were reported from a total of 44 individuals, within a final sample of 150 participants (after 2 deaths, 4 unobtainable), a fall rate of 29% The majority (88%) of falls reported were recorded within 2 months of the incident occurring. The mean age of participants was 76 years (range 66-91, SD 6.7); an unexpectedly high proportion of reported falls were from males (41%, n=28). Of the sample, 36% of participants aged over 75 had fallen and 36% of participants aged over 80 had fallen.

**Location**
The majority of falls occurred within a person’s own home (86%). The remainder occurred in the homes of friends or family (14%). As may be expected, most falls occurred between the hours of 6am and 6pm, as the majority of activities and movements are undertaken during these hours. As found in previous research (Brace et al, In Press), the majority of reported falls occurred in the garden (41%). The second most common location for falling was the living area of the home (25%), followed by the kitchen (9%) and bedroom (9%). Types of falls were varied but not dissimilar from Home Accident Surveillance System (HASS) data, Table 1.

<table>
<thead>
<tr>
<th>Fall Type</th>
<th>% falls in this study</th>
<th>% falls in older population *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slip</td>
<td>24</td>
<td>63</td>
</tr>
<tr>
<td>Trip/stumble</td>
<td>39</td>
<td>48</td>
</tr>
<tr>
<td>Fall on/from stairs/steps</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Fall on/from ladder/stepladder</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Fall from building/structure</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Other fall from one level to another</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Slip/trip no fall</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Body part gave way</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Unspecified</td>
<td>3</td>
<td>27</td>
</tr>
</tbody>
</table>

*1999 HASS data, DTI 2001

**Injury and recovery**
A large proportion (84%) of fall episodes resulted in some level of injury, with varying levels of severity (from bruising to fractures). 14% of falls resulted in hospital treatment and 11% in visits to the GP. The remaining 75% of fall-incurred injuries were self treated by the individuals concerned. Recovery time also varied according to severity of injury. Just under half of fall episodes resulted in an immediate recovery (22%) or a complete recovery within a number of days (23%). However, over half of reported incidents required further time for a complete recovery which involved several weeks (39%) or months (14%). One person died as a result of a fall.
Factors causing falls
The majority (66%) of falls were multifactorial in their causation (see quote below). In just over a third of cases (34%), individuals reported that only one factor had played a role in the incident. Table 2 gives a breakdown of the perceived causal factors in falls among the sample.

“I was putting bread out for the birds in the garden and I tripped on a raised paving slab on the patio. I was hurrying as it was cold out... I just flew forward onto my hands. It was first thing in the morning after breakfast and I was feeling a bit dopey as I was taking some new medication that was making me feel a bit peculiar. I think that certainly had something to do with it.”

Table 2. Causal factors in falls (multiple responses)

<table>
<thead>
<tr>
<th>Causal Factor</th>
<th>% of resulting falls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavioural</strong></td>
<td></td>
</tr>
<tr>
<td>Rushing</td>
<td>39</td>
</tr>
<tr>
<td>Trip over (unfixed) object, e.g. clutter</td>
<td>27</td>
</tr>
<tr>
<td>Fall from height</td>
<td>14</td>
</tr>
<tr>
<td>Inappropriate use of footwear</td>
<td>13</td>
</tr>
<tr>
<td>Carrying (reported to affect balance)</td>
<td>9</td>
</tr>
<tr>
<td>Carrying (reported to obscure vision)</td>
<td>7</td>
</tr>
<tr>
<td>Overstretching/bending</td>
<td>5</td>
</tr>
<tr>
<td>Pet related activity, e.g. trip</td>
<td>5</td>
</tr>
<tr>
<td>Light level</td>
<td>4</td>
</tr>
<tr>
<td><strong>Extrinsic</strong></td>
<td></td>
</tr>
<tr>
<td>Slippery surface (outdoors)</td>
<td>23</td>
</tr>
<tr>
<td>Trip over (fixed) object, e.g. furnishing</td>
<td>23</td>
</tr>
<tr>
<td>Uneven surface</td>
<td>16</td>
</tr>
<tr>
<td>Walking aid error</td>
<td>11</td>
</tr>
<tr>
<td>Slippery surface (indoors)</td>
<td>7</td>
</tr>
<tr>
<td><strong>Intrinsic</strong></td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>16</td>
</tr>
<tr>
<td>Body part gave way/collapsed</td>
<td>9</td>
</tr>
<tr>
<td>Poor vision</td>
<td>6</td>
</tr>
<tr>
<td>Dizziness</td>
<td>5</td>
</tr>
</tbody>
</table>

Falls, fall history and physical abilities
In this study, fallers were generally slightly older than non-fallers (mean 76 years compared to 74 years of age), and they had had more falls previously than non-fallers (mean of 1.07 compared to 0.77 previous falls per person). However, these differences were not significant. Although a proportion of falls were reported to be due to intrinsic risk factors (Table 2), no differences were found for general fall related health problems between fallers and non-fallers (93% and 91% respectively), mobility problems (55% and 59%), scores for activities of daily living (7.3 and 7.6), mean number of prescribed medications being taken (2.1 and 2.3 medications per day), type of accommodation lived in, or cohabitation status (43% of both groups lived alone).
Falls and reported behaviour in the home
There were no significant differences between fallers and non-fallers for reported changes in behaviour; 61% of fallers and 63% of non-fallers reported taking more care in their behaviour since the initial home interview. Similar numbers of fallers and non-fallers reported a fear of falling at the final interview (41% and 42% respectively). Furthermore, there were no significant differences in behaviour (reported in the previous interview), e.g. rushing, leaving items on the floor, carrying, undertaking DIY activities, between fallers and non-fallers. However, it is apparent that hurrying and keeping clutter on the floor are major contributors to the falls among this sample population, Table 2.

Falls and design of the home environment
The most common fall types of slipping and tripping (Table 1) were to a large extent caused by objects on the ground, and slippery and uneven surfaces (Table 2). These factors lead to implications for design with respect to: aesthetic, non-slip floor surfaces (indoor and outdoor); redesign/removal of (fixed) trip hazards, e.g. steps, raised thresholds; and, improvements in texture, type and level of surface. Of the 41% of falls that occurred in the garden, all were due to at least one of these factors.

Discussion
After more than two decades of research into the area, a sufficient quantity of convincing studies have been completed to give reliable estimates of fall incidence among community dwelling older people. Approximately 30% in the >=65 year age group, 40% in the >=75 year age group and 50% in the >=80 year age group, fall each year (Prudham and Evans, 1981; Tinetti et al., 1988). The figures found in this study are slightly lower than these estimates. It is unknown whether this is a reflection of uncaptured fall data, behavioural changes due to improved awareness, or simply owed to chance.

Cummings et al. (1988) found that in retrospective studies, recall of falls among older people is underestimated by 13-22% compared to prospective studies, depending on the time period of recall. Although most falls reported in this study were recorded within a short time period, it is possible that incidences may have been forgotten or overlooked.

It can be expected that older people who have a history of falling are more likely to fall again in future, due to frailty and loss of confidence. A slightly increased fall rate was found in this study although the finding was not statistically significant.

It is apparent that behavioural risk factors are major contributors to the falls amongst this sample population (Table 2). It could therefore be suggested that behavioural factors are strong elements in many falls. Little information exists due to the fact that behavioural risk factors are often ignored and unrecorded components due to a strong medical research perspective, concentrating on intrinsic risk factors (Brace et al., 2002).

The strong relationship between falls in the garden and extrinsic risk factors demonstrates a need for improved design and a ‘design for all’ ethos. As well as reducing the risk of falling, physical activity has been shown to modify a significant number of the risk factors associated with falling (Skelton and McLaughlin, 1996) so it seems inappropriate that some older people are trapped inside their homes, lacking the confidence and the ability to manage the environmental challenges of their gardens, surroundings that could well be used to improve health, quality of life and independence.
Conclusions

If falls are to be reduced amongst this population, it is imperative that all aspects of fall causation are well considered and appropriately addressed. Although not shown to be a statistically significant factor in this study, behaviour is still an area that requires further investigation. Opportunities exist to reduce the risk of older people falling in and around the home, with respect to the design of products and buildings. Clearly, if the incidence of falls can be reduced, people can live for longer, both more healthily and more independently, in their own homes.

Acknowledgements

The authors wish to acknowledge the support of the Department of Trade and Industry (DTI) who sponsored part of this research. The views expressed, however, are those of the authors and do not necessarily represent those of the DTI.

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Department of Trade and Industry (DTI). 2001, HASS listings for 1999, for males and females aged 65 and above. (Department of Trade and Industry, 2001)
BEHAVIOUR, PRODUCT AND ENVIRONMENTAL INTERACTION AFFECTING RISK OF OLDER PEOPLE FALLING IN THE HOME

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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. The research reported in this paper addresses this problem, while also giving consideration to the practicalities of everyday living for older people. Interviews were conducted with 177 community dwelling people from 150 households from the UK population (aged 65+) The study has highlighted many behavioural and design factors involved in fall risk. These include footwear, walking aids, storage, use and design of domestic products in combination with behaviour such as hurrying, carrying objects, and keeping pets. Reducing falls in the home among this population requires a holistic approach, which is demonstrated by the proposed model.

INTRODUCTION

It has been well documented over the years that a third of individuals over 65, and nearly half of those over 80, fall each year. 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). Fall related incidents are influencing factors in nearly half of the events leading to long-term institutional care in older people (Kennedy and Coppard, 1987). Clearly, if the incidence of falls can be reduced, people can live longer, more healthily and more independently in their own homes, with a better quality of life.

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 a high prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a relatively mild fall dangerous.

Over 400 potential risk factors for falling have been identified, which are commonly split into categories of intrinsic and extrinsic risk. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls, e.g. decreased balance ability, disturbed gait, etc. Extrinsic factors are environmental hazards that present an opportunity for a fall to occur, including floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting etc. However, individual fall incidents are generally multifactorial.

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.

Previous research (Hill et al, 2000; Brace et al., In Press) has identified important behavioural factors which affect the risk of older people falling in the home, e.g. rushing, carrying objects. It has also been found that behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, affecting confidence and fear of falling.

Also of interest is the extent to which the design of domestic products and areas of the home might be factors in falls. Although environment-related risk factors are reported to be causal in around 33% of falls, it has only been recently that detailed work has been done to look at the design of some areas of the home environment in relation to older people, falls and independent living (Brace et al, 2002).

The aim of this investigation, therefore, was to provide insight into older peoples’ interactions with their home environment that may affect risk of falling and their knowledge of factors affecting fall safety.

METHOD

Preliminary focus groups (5) were conducted with older people (30 participants in total) to gain insight into the problem. The discussions were used to collect preparatory 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), 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.

Interviewees were briefed both verbally and in writing about the study prior to participation. They were informed that the discussions 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 prior to the discussion, to avoid leading responses in any particular direction. Each interview lasted approximately two hours, with all interviews conducted by the same researcher.

RESULTS

Mean age of participants was 76 years (range 65-99), of whom the majority (73%) were female. Half the sample (47%) lived alone and 93% had at least one health problem (40% of falls), stairs (23%) bathroom (8%), and kitchen (6%), due to the nature of the tasks performed in these places (bending, reaching, etc.) and the environmental hazards present. Such hazards encompassed changes in level and surface type and texture, slopes, objects left on the floor and rugs. Specific issues included steps within the house or garden (particularly in older properties), other changes in level, and slippery or uneven surfaces. Slippery floors alone were reported to have caused nearly one fifth of falls (17%). Raised door thresholds at doorways, were also remarked upon as problematic and resulted in 6% of falls. Lack of storage space was another problem highlighted, resulting in objects being left on the floor (which was causal in 13% of falls), particularly if an occupant had moved into a smaller property than lived in previously. Often when storage was available, it was difficult to access, such as kitchen cupboards that are too high to reach without using steps etc.

Some features of the home environment e.g. grab rails, were thought to assist in tasks of everyday living. However, it was emphasized that grab rails are useless unless they have been positioned appropriately for the user.

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. Simple modifications can easily cause problems if they are not thought through properly, and this was often the case.

Participants accepted that actions affecting the home environment also affect safety. These included fall risks introduced by occupants, e.g., leaving things on the floor, maintenance and type of floor, use and condition of low-lying furniture, and the provision of lighting. Cohabitation, visitors and pets were also believed by study participants to be factors; other inhabitants and visitors (including grandchildren) were reported to result in an increase in ‘clutter’, especially unexpected objects, which were not usually present. Pets underfoot and pet items including food bowls and toys were also reported as an issue for fall safety, due to tripping, although were contributory in only 1% of episodes. Individual capability affected by environment was also discussed as amplifying risk of falling.

Inappropriate footwear and spectacles, use of medication, use or non-use of lighting, and a lack of regular exercise were examples discussed by interviewees.

Although there were no significant relationships between falls and physical measures, qualitative evidence on age-related factors thought to lead to increased risk of falling highlighted the negative effects of decreased mobility, reduced balance and strength, and deteriorating vision. Comments were made about the importance of support from
family, friends and health professionals, although it was emphasized repeatedly by interviewees that older people do not want to be or be seen as a ‘burden to society’ and wish to remain independent in their own homes for as long as possible.

Many of the falls reported in this study have occurred due to a mismatch between the individual and their environment. 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 hazards occur in the environment, because of the individual’s reduced ability to be able to cope with these hazards. Usually behaviour plays a role in this in one or a combination of three possible forms (Hill et al., 2000); behaviour involved in direct interaction with the environment (e.g. hurrying, carrying items, inappropriate use of steps and ladders), behaviour affecting the environment (e.g. untidiness, choice and location of furnishings, risks associated with ownership of pets), and; behaviour affecting individual capability (e.g. exercise, use of medication, alcohol and spectacles).

An individual may choose to move about their home in a way that increases fall risk, or design and keep their home in a certain way, or impose an option on themselves that affects their personal limitations. These choices may be due to a lack of awareness of their personal limitations and failure to adjust their behaviour accordingly. However, these behaviours are all dependent on physical and psychological health, fall history, socio-economic status, pressure and support from family and health professionals, and product and equipment interaction. These findings have been drawn together in a proposed model, detailing the influences in falls among older people in the home, Figure 1: The environment in which an older person resides and the equipment and products that are used should be designed appropriately for the individuals’ capabilities in order to keep the demands of the environment and equipment as usable as possible. An individual’s behaviour affects intrinsic, extrinsic and peripheral influences, each of which in turn have an impact on behaviour and each other.

**DISCUSSION**

This research has found risk factors for falling to be widespread, especially with regard to fundamental design features and interviewees’ behaviour. This research supports previous suggestions (Hill et al., 2000; Haslam et al., 2001) that despite many risk factors for falling in the home being apparent to older people, this awareness does not necessarily influence how they behave in practice.

In some cases a risk may be recognised, but without behaviour making an allowance for it. For example, some of the interviewees did not, or did not want to, acknowledge that their physical abilities had deteriorated with a decline in health status, and therefore continued with activities regardless of this. It is difficult to say what is the best advice to give to this population. It is important in terms of health, autonomy and independence to remain active for as long as possible in old age, conversely, it is not prudent to advise older people to continue with activities that could be a danger to health and well being. On the other hand, some people are very sensitive to the issue of fall safety and have made modifications themselves to their homes. In some instances, interviewees appear to be ‘ageing gracefully’, by putting in place new mechanisms and methods for completing activities of daily living, and being sensibly cautious in their behaviour.

In other cases, a risk may not be recognized or understood. A lack of awareness of risk 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. The serious immediate and long-term implications of having a fall were generally well understood by the sample, due to personal experiences or those of friends or relatives. However, less than 5% of the sample could recall ever seeing or receiving any advice or information about fall safety.

**CONCLUSIONS**

Opportunities do exist to reduce the risk of older people falling in and around the home, with respect to behaviour, product and environmental interaction. Behaviour has been highlighted and it is evident that further information is needed to direct the precise course of action for health promotion. However, efforts can be made to improve design of products and equipment for older people to use, and homes for older people to live in, with fewer demands and challenges.

Most importantly, there is a need to raise awareness of the problem and provide practical fall prevention advice, which is respectful and encourages individuals to realise that falling is not an inevitable and uncontrolable part of ageing.

**ACKNOWLEDGEMENTS**

The authors wish to acknowledge the support of the Department of Trade and Industry (DTI) who sponsored this research. The views expressed, however, are those of the authors and do not necessarily represent those of the DTI.

**REFERENCES**


Figure 1. Influences affecting older peoples’ risk of falling in the home
FALL CAUSATION AMONG OLDER PEOPLE IN THE HOME: THE INTERACTING FACTORS

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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. Focus groups and interviews were carried out with 207 older people. The findings of this investigation suggest that there are a variety of interacting factors which affect risk of falling, including intrinsic, extrinsic and peripheral influences and that behaviour is an overarching control over all of these. It can be concluded that older people who are at risk of falling need to be better educated on the individual risk factors and on the help that is available to support them in healthy aging.

Introduction

It has been well documented over the years that a third of individuals over 65, and nearly half of those over 80, fall each year. 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). Fall related incidents are influencing factors in nearly half of the events leading to long-term institutional care in older people (Kennedy and Coppard, 1987). Clearly, if the incidence of falls can be reduced, people can live longer, more healthily and more independently in their own homes, with a better quality of life. 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 a high prevalence of clinical diseases (e.g. osteoporosis) and age-related physiological changes (e.g. slowed protective reflexes) makes even a relatively mild fall dangerous.

Over 400 potential risk factors for falling have been identified, which are commonly split into categories of intrinsic and extrinsic risk. Intrinsic factors are age and disease related changes within the individual that increase the propensity for falls, e.g. decreased balance ability, disturbed gait, etc. Extrinsic factors are environmental hazards that present an opportunity for a fall to occur, including floor surfaces (textures and levels), loose rugs, objects on the floor (e.g. toys, pets), poor lighting etc. However, individual fall incidents are generally multifactorial.
Personal and environmental risk factors for falling among this group are well documented, although it is only recently that the influence of behaviour has been investigated in relation to these risks (Hill et al., 2000; Brace et al., 2003). Important behavioural factors which affect the risk of older people falling in the home have been established, e.g., rushing, carrying objects. It has also been found that behaviour patterns change after a fall episode; general psychological state and experience can have an effect on the individual, affecting confidence and fear of falling, and general behaviour.

Of further interest is the extent to which the design of domestic products and areas of the home might be factors in falls. Although environment-related risk factors are reported to be causal in around one third of falls, it has only been lately that detailed work has been done to look at the design of some areas of the home environment in relation to older people, falls and independent living (Brace et al., 2002).

Method

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Interviewees were briefed both verbally and in writing about the study prior to participation. They were informed that the discussions 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 prior to the discussion, to avoid leading responses in any particular direction. Each interview lasted approximately two hours, with all interviews conducted by the same researcher.

Results

Intrinsic influences

Mean age of participants was 76 years (range 65-99), of whom the majority (73%) were female. Half the sample (47%) lived alone and 93% had at least one health problem related to falling, including problems with vision (35%). One or more medications were taken daily by 79% of the sample and 4 or more taken daily by one quarter (23%) of interviewees. Half the individuals (48%) had fallen at least once in the last 2 years, and
21% had experienced 2 or more falls in this period. Participants were of varying health status and inhabited a range of differing accommodation.

Although there were no significant relationships between falls and physical measures, qualitative evidence attributed intrinsic factors as the primary cause in just under one fifth (18%) of falls. Age-related factors thought to lead to increased risk of falling included the negative effects of decreased mobility, reduced balance and strength, and weakened vision. Individual capability affected by such behaviour was discussed as amplifying risk of falling. The inability to cope with chosen footwear and spectacles, the use (or non-use) of lighting and prescribed medication, and a lack of regular exercise, were examples discussed by interviewees.

**Extrinsic influences**

Nearly half (44%) of reported falls were attributed primarily to extrinsic factors. The design of buildings and gardens were reported to introduce risks. This was apparent when examining the areas of the home where falls were reported to occur, e.g. garden (40% of falls), stairs (23%) bathroom (8%), and kitchen (6%), due to the nature of the tasks performed in these places and subsequent behaviour (bending, reaching, etc) and the environmental hazards present. Slippery floors alone were reported to have caused nearly one fifth of falls (17%).

Choice of footwear was perceived to be a factor in fall safety, particularly the quality, thickness, grip and durability of the sole. Choice and use of footwear was reported as contributory in 10% of falls.

The design of some domestic products were reported to have directly contributed to falls (6% of cases), including oven and dishwasher doors that open downwards forming a trip hazard, or cleaning equipment that is heavy and difficult to hold.

One quarter of users of walking aids reported problems with their design and use that affected risk of falling; such devices were reported to be directly causal in 4% of incidents, and were often stated to be unsuitable for use in the home environment, due to the changes in floor surface and texture, and limited room for manoeuvre.

Combined with these extrinsic factors, behaviours involving direct use of the home environment were reported to affect fall risk. These included aspects of house maintenance, e.g. changing light bulbs, using stepladders, and clutter (25%). Lack of storage space was a problem highlighted, resulting in objects being left on the floor (which was causal in 13% of falls). Often when storage was available, it was difficult to access, such as kitchen cupboards that are too high to reach without using steps etc.

**Peripheral influences**

Comments were made about the importance of support from family, friends and health professionals. However, this is dependent on socio-economic issues, and the proximity of family, friends and falls services. On the other hand, it was emphasized repeatedly by interviewees that older people do not want to be, or to be seen as, a 'burden on society' and wish to remain independent in their own homes for as long as possible.

It was clear that the majority of the cohort had little knowledge about the help and support that was available to them in their local area. This is something that urgently needs to be addressed, as without the advertising and subsequent awareness of fall related health and community services, many older people are missing out on useful opportunities.
Discussion

From the findings of the research, a model of the interacting influences has been proposed, Figure 1. Although an individual has little choice over their general physical state and subsequent abilities, they do have some facility to maintain their health at its current level, e.g. by exercising, and cutting down (with help from their GP) on polypharmacy effects. However, an individual may choose to move about their home in a way that increases fall risk, due to their specific capabilities, e.g. rushing, carrying etc. Additionally, a person may choose to design and keep their home in a certain way, or impose an option on themselves, that affects their personal limitations. The model demonstrates how falls arise from an interaction between an older person’s physical capabilities (intrinsic influences), and the design, condition, suitability and use of their home environment and of aids and equipment (extrinsic influences). The home environment and equipment are in turn influenced by the interaction with health professionals, family etc., and the older person’s socio-economics (e.g. the ability to be able to afford to make changes to the home or equipment) and knowledge and understanding of fall risk. These are the peripheral influences. The latter also impact on intrinsic influences, e.g. in terms of medical support from health professionals.

Any of these choices may be due to a lack of awareness of their personal limitations and failure to adjust their behaviour accordingly. However, these behaviours are all dependent on physical and psychological health, fall history, socio-economic status, pressure, support from family and health professionals, and product and equipment interaction. These findings have been drawn together in the proposed model, detailing...

The influences in falls among older people in the home. The environment in which an older person resides and the equipment and products that are used should be designed appropriately for the individuals’ capabilities in order to keep the demands of the environment and equipment as usable as possible. An individual’s behaviour affects intrinsic, extrinsic and peripheral influences, each of which in turn have an impact on behaviour and each other.

Conclusions

Behaviour has been highlighted as an overarching control in fall risk and it is evident that further information is needed to direct the precise course of action for health promotion. This could involve further analysis of the specific health beliefs that older people exhibit with respect to fall risk. However, in order to combat negative health behaviours, efforts should be made to reduce the demands and challenges of products and equipment for older people to use, and the homes in which older people live in.

Most importantly, it appears that there is a need to raise awareness of the falls epidemic, amongst all stakeholders and to provide practical fall prevention advice. This approach must encourage individuals to realise that falling is not an inevitable and uncontrollable part of ageing.

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