The impact of peer-led falls prevention education on community-dwelling older adults: A mixed methods evaluation

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Chapter

2

Chapter 2

Review of the Literature

2.1 Scope of the Review

The research presented in this thesis was conducted in a community setting, so the focus of the literature review is also confined to the community setting. Although falls occur more commonly in residential care and hospital settings, these settings and populations have different epidemiology and are regarded by falls researchers as requiring interventions and research methods specifically tailored for those settings (Cameron et al., 2012). Accordingly, with community settings in mind, the purpose of this literature review is to present the background, justification of and rationale for the present research studies.

2.2 Defining a Fall

A *fall* has been consistently described as a change in body position towards a lower level but there are variations of what constitutes a fall in research studies (Hauer et al., 2006; Zecevic, Salmoni, Speechley, & Vandervoort, 2006). Falls have been described in terms of context such as preceding events leading up to a fall or aetiology contributing to a fall (Hauer et al., 2006; Kellogg International Work Group, 1987; Zecevic et al., 2006). Moreover, older adults have been found to use the term slips, trips and falls interchangeably (Zecevic et al., 2006). Therefore, it has been suggested that an operational definition of a fall should be used (Zecevic et al., 2006). The operational concept of a fall should be comprehensive, be clearly defined as well as at a level of understanding suitable for a layperson such as an older adult (Gillespie et al., 2012; Lamb et al., 2005). In addition, the use of a standardised definition of a fall should facilitate reliability in comparison of results across studies (Hauer et al., 2006; Zecevic et al., 2006).

Accordingly, for the purpose of this research and thesis, a fall is defined as "an unexpected event which the participants come to rest on the ground, floor, or lower level" (Lamb at al., 2005, p. 1619).

For this research, an older adult is defined as someone 60 years or older. This chronological cut-off age accords with the definition used in two peer-led falls prevention education programs (Deery, Day, & Fildes, 2000; Garner et al., 1996) and other research (Gillespie et al., 2012).

For this research, community-dwelling older adults are defined as those living at home or residences such as retirement villages that do not provide residential health-based care or rehabilitative services (Gillespie et al., 2012). This excludes those older adults living in residential care facilities or older adult populations in hospitals.

2.3 The Research Problem

Falling in older adults is a major public health problem and has serious consequences for the individual, family and community in general. There is strong evidence that falls prevention interventions can reduce falls in community-dwelling older adults. However, poor uptake and adherence has limited the translation of this evidence into practice and hence, the success of such interventions amongst community-dwelling older adults is limited.

The purpose of Section 2.3 is to review the literature regarding the epidemiology of falls in Australia and other western developed countries such as the United Kingdom (UK) or United States of America (USA). As such, the prevalence, cost, consequences of falling, falls-related risk factors as well as evidence-based strategies pertaining to community-dwelling older adults will be discussed. Finally, the current understanding of the enablers and barriers to uptake and adherence of evidence-based falls prevention strategies that community dwelling older adults experience will also be presented in the next Section 2.4.

2.3.1 Epidemiology of falls among community-dwelling older adults

2.3.1.1 Prevalence of falls in the community

Differences in falls incidence/prevalence reported could be affected by factors such as the aim of a study, definition of a fall, sample cohort stratification, inclusion and exclusion criteria, and method of collecting falls data (Cumming, Kelsey, & Nevitt, 1990).

A prospective study involving a large random sample of 5,681 New South Wales community-dwelling residents aged 65 years and above and conducted in 2009 (Centre for Health Advancement and Centre for Epidemiology and Research, 2010). found that 25.6% of older adults reported a fall at least once in the previous twelve months (Milat et al., 2011). Regarding recurrent falls, estimates ranging from 10% to 16 % of community-dwelling older adults who experienced two or more falls in the past year were found in other prospective studies using representative cohort samples (Pluijm et al., 2006; Stalenhoef, Diederiks, Knottnerus, Kester, & Crebolder, 2002; Tinetti, Inouye, Gill, & Doucette, 1995; Tromp et al., 2001). Those deemed as having a high risk of recurrent falling also have a high risk of injury (fractures and loss of independence) (Pluijm et al., 2006). In addition, there is an age-related increase in the incidence of falls. Milat et al. (2011) found that only 21.5% of those in the 65-69 age group reported a fall, compared to 34% in the 85-89 age group and 35.9% in the above 90 age group in the NSW (Australia) community.

2.3.1.2 Costs of falls

In Australia, 55% of all hospitalised falls injuries occurred in adults over 65 years of age from the period 2012 to 2013 (AIHW: Pointer, 2015). Currently, the average total length of stay per fall injury hospitalisation is approximately 15.5 days accounting for over 1.3 million hospital patient days being recorded in 2009-2010 for falls-related admissions in Australia (AIHW: Bradley, 2013). After inpatient hospital admissions, cost of long term care is the next highest cost component (Scuffham, Chaplin, & Legood, 2003).

While hospital-related costs account for most of the costs associated with falling for older adults living in the Australian community (Centre for Health

Advancement and Centre for Epidemiology and Research, 2010), many falls did not result in hospitalisation (Milat et al., 2011). Though 66% of those who fell sustained an injury and 20% visited the hospital, 90% of the older adults did not need an admission to hospital (Milat et al., 2011). In these cases, other non-hospital costs should be considered (Centre for Health Advancement and Centre for Epidemiology and Research, 2010). These costs may include outpatient medical treatments, pharmaceutical, allied health, community nursing and domiciliary services (Centre for Health Advancement and Centre for Epidemiology and Research, 2010). Older adults who fall, and especially those who fall repeatedly, are more likely to use healthcare services than older adults who do not fall (Rizzo et al., 1998).

Falls incur an overall economic cost to a country. A standardised economic cost review identified substantial healthcare costs involved with older adults' falling worldwide in developed countries (Davis et al., 2010). In 2008, the USA incurred approximately US$23 billion costs relating to non-fatal falls annually, and the UK incurred about US$1.6 billion. Comparatively, Australia's cost was US$143 million and projected to increase to US$151 million by 2021 (Davis et al., 2010). There has also been a rate increase of 3.5% (95% CI 3.1-3.9) per year in falls-related hospitalisations for older adults from 2003-2012 with an increase from 2,000 to 3,000 persons for males and 3,500 to 4,500 persons for females per 100,000 population (Harvey, Mitchell, Brodaty, Draper, & Close, 2016). This rate has been projected to escalate 2.5 times and the total cost of falls has been projected to increase to over $1.375 billion per year by 2051 (Moller, 2003). However, while these estimates highlight that falls are a serious and costly problem for countries, the impact and consequences of falling on the individual and community go well beyond economic costs.

2.3.1.3 Consequences of falls

Falls are a significant cause of morbidity and mortality for older people and have a substantial negative impact on older adults' independence, function and quality of life (Alamgir, Muazzam, & Nasrullah, 2012; Kannus et al., 1999; Rubenstein, 2006; Sattin et al., 1990). Falls accounted for 29% of unintentional injury mortality cases in 2006 (Alamgir et al., 2012) and the rate of death and injury rises with increasing age (Sattin et al., 1992; Tovell et al., 2014).

Falls can also result in physical injuries and social and psychological consequences (Campbell et al., 1990; Craig, Murray et al., 2013; Milat et al., 2011; Rubenstein, 2006; Tovell et al., 2014). Regarding consequences, the findings reported in the following studies differ due to varying population profiles, settings (including Australia and different Western countries) and measures used (Masud & Morris, 2001; Peel, 2011).

Studies have estimated that between 20-66% of falls result in injuries (Craig, Murray et al., 2013; Milat et al., 2011) although most injuries are relatively minor (for example, cuts, grazes, bruising). Approximately 3%-13% of all falls result in fractures (Campbell et al., 1990; Rubenstein, 2006; Tovell et al., 2014). Of these, hip fracture is the most serious falls-related injury with 15% of older hip fracture patients dying in hospitals and about 20% not surviving beyond the first year after the fracture (McClure et al., 2005; Wolinsky, Fitzgerald, & Stump, 1997). Those who survive their hip fractures are likely to suffer long-term disability and increased social dependence, reflecting a reduced quality of life (Hall, Williams, Senior, Goldswain, & Criddle, 2000; Wolinsky et al., 1997). A study found that 25% to 75% of older patients who fractured their hips do not return to their pre-morbid level of function and mobility (Magaziner, Simonsick, Kashner, Hebel, & Kenzora, 1990). The healthcare costs of hip fracture are also the costliest of falls injuries (Davis et al., 2010).

While there has been a reported trend of decreasing rates of hip fractures in some countries such as Australia, there has been an estimated increase of about 7% in the rate of traumatic brain injury due to falls in 2009-2010, compared to previous years (AIHW: Bradley, 2013). Harvey and Close (2012) have reported that 83% of traumatic brain injury hospitalisations are due to falls-related episodes and the mortality rate is in the region of 13%.

Falling can also affect the broader health and well-being of older adults according to the findings reported in a recent large Australian prospective longitudinal study (Peeters, Jones, Byles, & Dobson, 2015). This study followed 10,277 participants at three-year intervals for a period of twelve years, and found that those who had fallen fared significantly worse in terms of their physical, social and functional capacity (Peeters et al., 2015). Moreover, experiencing a fall(s) increases the risk of premature admission to residential care (Peel, 2011).

Consequences of falls can also extend beyond the physical aspects, affecting the social and psychological domains. Psychological consequences such as developing a fear of falling leading to a loss in self-confidence in daily function (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008) may also occur. While there are many definitions of fear of falling, one systematic review described fear of falling as an umbrella term to encompass falls-related self-efficacy, concerns about balance in mobility, leading to avoidance of activity (Zijlstra, van Haastregt, van Eijk, et al., 2007; Zijlstra, van Haastregt, van Rossum, et al., 2007). Prevalence of fear of falling has been reported to range from 21–85% (Zijlstra, van Haastregt, van Eijk, et al., 2007) and has also been reported to be present even in 50% of older adults who have not experienced a fall (Scheffer et al., 2008). Fear of falling can be a cause or a consequence of falling and has been associated with subsequent reduced quality of life, loss of self-efficacy, activity avoidance and depression (Deshpande, Metter, Lauretani, Bandinelli, & Ferrucci, 2009; Scheffer et al., 2008).

Fear of falling can trigger the onset of depression or vice versa, the association between the two psychological states has been described as reciprocal or bidirectional (van Haastregt, Zijlstra, van Rossum, van Eijk, & Kempen, 2008). Depression affects about 12-15% of community-dwelling older adults and can be triggered by falling, fear of falling or become a risk factor for falling (Beekman et al., 1995; Blazer & Williams, 1980). Depression was associated with an increase in risk of falling and recurrent falls in older adults (Deandrea et al., 2010; Gassmann, Rupprecht, Freiberger, & Group, 2009; Stalenhoef et al., 2002). This is because older adults' depression has been associated with impaired cognitive and motor performance (McDermott & Ebmeier, 2009; Wright, Kay, Avery, Giordani, & Alexander, 2011). Such impairments can influence gait stability, hence increasing older adults' risk of falling (Yogev-Seligmann, Hausdorff, & Giladi, 2008).

2.3.1.4 Risk factors for falling

Falls usually arise from a combination of different risk factors (Rubenstein, 2006). Generally, the higher the number of risk factors, the higher the risk of falling (Nevitt, Cummings, & Hudes, 1991; Tinetti & Williams, 1998). Risk factors associated with falling are characteristics that predispose individuals to falling compared to individuals who do not possess such characteristics (Rubenstein, 2006).

Epidemiological studies revealed that over 400 risk factors have been identified and there are various ways of classifying falls-related risk factors (Masud & Morris, 2001). Risk factors can be broadly classified as intrinsic in nature (within the individual, such as physiological changes associated with ageing, impaired vision, impaired balance) or extrinsic (external to the individual, such as environmental factors) or an interaction of both intrinsic and extrinsic risk factors (Cesari et al., 2002; Tideiksaar, 1989). These risk factors can be further re-classified as modifiable and non-modifiable risk factors. Modifiable risk factors are reversible precipitating characteristics that may be intrinsic or extrinsic in nature (Tideiksaar, 1989). Non-modifiable risk factors are those that are not reversible in nature such as age or gender (Tideiksaar, 1989). Given the large number of risk factors that have been reported to be associated with falls (Deandrea et al., 2010; Masud & Morris, 2001), this review does not attempt to review the literature exhaustively but will be limited in scope to presenting an overview of the modifiable risk factors with the strongest associations with falls and those relevant to this research.

A recent systematic review of 74 prospective studies found risks of falling for community-dwelling older adults associated with history of falls, vertigo, Parkinson disease, impaired vision, gait problem, use of medication, use of walking aid and depression (Deandrea et al., 2010). For this research, the modifiable risk factors that will be discussed are:

- Sensory impairment, such as disorders with vision
- Physical impairment involving disorders with mobility issues such as gait, foot, and postural instability/balance problems
- Use of medication, including the number of medications taken and the use of some medication types associated with increased falls risk
- Environmental home hazards

Impaired vision has been shown to be a significant risk factor for falls in community-dwelling older adults (Ivers, Norton, Cumming, Butler, & Campbell, 2000; Lord & Dayhew, 2001). An estimated 20% of community-dwelling older adults have impaired vision, and the rate increases as individuals age (Evans et al., 2002). Regardless of the type of vision lost (visual acuity, contrast sensitivity, depth perception or visual field), vision plays a critical role in safe mobility and environmental hazard detection (Lord & Dayhew, 2001).

Mobility issues such as impaired gait, foot and ankle problems and postural stability disorders (balance) in older adults increase their risk of falls because these problems affect ability to balance effectively in situations when falls may occur (Deandrea et al., 2010; Menz & Lord, 2001; Menz, Morris, & Lord, 2006; Shumway-Cook, Brauer, & Woollacott, 2000; Stubbs et al., 2014). Between 20 and 50% of older adults have reported experiencing gait disorders and balance deficits (Rubenstein, 2006), while 36% suffer foot problems such as foot lesions, structural deformity or disabling foot pain (Barr, Browning, Lord, Menz, & Kendig, 2005; Menz et al., 2006). Foot pain and reduced ankle dorsiflexion range of motion are important foot-related risk factors that significantly impair older adults' mobility (Menz, Morris, & Lord, 2005). Inappropriate footwear was also identified as a falls risk factor (Gabell, Simons, & Nayak, 1985; Sherrington & Menz, 2003). Seventy-five percent of falls-related hip fracture participants reported wearing inappropriately designed footwear at the time of falling (Sherrington & Menz, 2003).

Studies have shown a significant association between type of medications and number of medications taken by older adults and risk of falls (Hartikainen, Lonnroos, & Louhivuori, 2007; Landi et al., 2005; Leipzig, Cumming, & Tinetti, 1999a; Woolcott et al., 2009). Medication has been recognised as a risk factor for falling because of age-related changes and probability of existing co-morbidities in older adults (Boyle, Naganathan, & Cumming, 2010; Deandrea et al., 2010). Several systematic reviews have evaluated the use of medication associated with risk of falling (Hartikainen et al., 2007; Leipzig et al., 1999a, 1999b; Woolcott et al., 2009) and the findings are illuminating. Medications with increased risk of falling were sedatives or hypnotics (an estimated 47% increased risk) and in particular benzodiazepine and antidepressants (61% increased risk) (Woolcott et al., 2009). These high falls-risk medications have an impact on the physiological status of older adults either via a direct effect on the individual's central nervous system or through interactions with other medications (Boyle et al., 2010; Hill & Wee, 2012). The physiological effects reported can include affected vision, fatigue, impaired physical performance, postural hypotension, postural instability, delayed balance reactions, dizziness, and cognition changes such as memory loss (Agostini & Tinetti, 2002; de Groot et al., 2013; Gray et al., 2003; Hanlon et al., 1998; Hill & Wee, 2012; Lord, Anstey, Williams, & Ward, 1995). Furthermore, it has been shown that the higher the dosage or duration of the

high falls-risk medication taken, the higher the risk of hospitalisation after a fall (Pratt et al., 2014). Polypharmacy in older adults is deemed to be the concurrent use of four or more medications (Bjerrum, Rosholm, Hallas, & Kragstrup, 1997). The higher the number of medications taken, the higher the risk of falls (Hartikainen et al., 2007). This is shown where the likelihood of falls was increased by 30% when four or more medications (polypharmacy) were taken compared to those who did not take any medications (Tromp et al., 2001).

The majority (59%, n=41,080) of hospitalised fall injuries reported during 2009-2010 in Australia, adults aged 65 years and over, were reported to occur in and around the home (AIHW: Bradley, 2013). Of those injuries, 28% (n=19,495) occurred inside the home itself. Particularly, areas inside the home that were shown to be especially hazardous were bathroom (6.5%) and the bedroom (5.5%). Environmental home hazards are risk factors for falling (Lord, Sherrington, Menz, & Close, 2007; Rubenstein & Josephson, 2006) and have been found to increase the risk by 38% (Letts et al., 2010). Potential environmental home hazards identified in a validated home safety checklist involved 14 areas related to the home or the person (Clemson, 1997). In particular, around the bathroom, these included floor surfaces, shower recess and grab rail; for the bedroom, bed height, wardrobe and lighting were highlighted (Clemson, 1997). According to Clemson (1997), falls risk management involves assessment of the home environment including recommendations for safety such as eliminating, reducing or modifying the hazard. Besides adaptations to the home environment, other studies have determined environmental interventions to include provision of mobility aids such as walking aids; and communication aids such as personal alarms (Gillespie et al., 2012).

However, environmental and home hazards alone are often an insufficient falls risk factor explanation and it is the interaction between the environmental hazard and the older adult that is of considerable significance (AIHW: Pointer, 2015; Lord, Menz, & Sherrington, 2006). The risk factor for falling can arise when there is a mismatch between the individual's abilities or behaviour and exposure to the potential hazard. There is a higher likelihood that some older adults with intrinsic impairments such as physical or visual impairments have a lesser capacity to cope when exposed to potential hazards in the environment (Hornbrook et al., 1994). This combination with

the environment can manifest as a risk factor for falling (Hornbrook et al., 1994; Lord, Menz, & Sherrington, 2006; Rubenstein, 2006).

Twenty-four percent of adults aged 65 years and over use a walking aid (assistive device) and one-third use more than one device (Gell, Wallace, LaCroix, Mroz, & Patel, 2015). Using a cane is the most common walking aid (Gell et al., 2015). Although walking aids have been reported to be beneficial for those older adults requiring assistance, evidence regarding the use of a walking aid as a risk factor is mixed. Several studies have suggested that such use can be protective of those with physical and mobility impairments by increasing gait stability and so reduce the risk of falling (Graafmans, Lips, Wijlhuizen, Pluijm, & Bouter, 2003; Hardi, Bridenbaugh, Gschwind, & Kressig, 2014). Empirical research showed improvements in gait stability, decreased attentional demands, and decreased pain by reduced weight-bearing on limbs. These were seen as factors contributing to reducing the risk of falls in community-dwelling older adults (Bateni & Maki, 2005; Hardi et al., 2014; Jansen et al., 2015; Miyasike-daSilva, Tung, Zabukovec, & McIlroy, 2013). Moreover, some older adults described feeling safer when using an aid and some older adults identified a walking aid as part of their plan to reduce their risk of falling (Aminzadeh & Edwards, 1998; Jansen et al., 2015). While the above benefits were reported, there was also evidence that conflicted with the recommendation regarding the use of a walking aid reducing the risk of falling. Systematic reviews reported insufficient evidence that using a walking aid reduced the number of falls or fallers (Karlsson, Magnusson, von Schewelov, & Rosengren, 2013; Ohare, Pryde, & Gracey, 2013). In addition, several studies have reported the use of a walking aid as contributing to a two to three-fold rise in the risk of falling (Deandrea et al., 2010; Letts et al., 2010; Rubenstein & Josephson, 2002). Such evidential inconsistency could arise for several reasons. There is likelihood that walking aid use indicates an increased physical impairment with an inherent increased risk of falling in this group of older adults (Campbell, Reinken, Allan, & Martinez, 1981). Moreover, studies have found that a majority (70%) of mobility aid users lacked prior healthcare consultations and hence were not likely to receive advice regarding the choice of aid; nor had they received the appropriate training in using the aid safely (Liu, 2009; Liu, Eaves, Wang, Womack, & Bullock, 2011). It has been found that there are increased biomechanical and metabolic demands with using walking aids that might translate to in an increased risk

of falling without the consultation and appropriate training (Bateni & Maki, 2005). In summary, some older adults with impairments may not be using the appropriate walking aid or using the aid appropriately, which can increase their risk of falling. As such, walking aid use, or lack of use, can be considered a risk factor for falling.

2.3.2 Evidence for reducing falls among the community-dwelling older adult population

Falls prevention strategies can be implemented as a single strategy or combination of strategies. Based on the Prevention of Falls Network Europe (ProFANE) classification, a single strategy intervention consists of one major strategy that is applied to all participants (Lamb et al., 2011). An example might be falls prevention education delivered to each of the community-dwelling older adults participating in a study. Multifactorial interventions consist of more than one strategy and involve a combination of strategies such as home modification and exercise programs depending on individual risk assessment (Lamb et al., 2011). In comparison to the above, a multiple intervention is where two or more major strategies are applied to every participant within the study (Lamb et al., 2011).

The most recent systematic review regarding falls prevention conducted by the Cochrane collaboration, with 79,193 community-dwelling older adult participants across 159 randomised controlled trials by Gillespie et al. (2012), reported several effective single falls interventions. These were exercise interventions (gait, balance or strength training), medication review (supplementation with Vitamin D), surgery (cardiac pacemaker, first cataract surgery), and environment modifications (home safety, footwear and mobility aids). In the review, the most common trialled single intervention reported was exercise (59 trials), with 40 programs being multifactorial in design (Gillespie et al., 2012). It also found that multifactorial falls intervention programs such as an individually tailored combination of interventions based on risk assessment or multiple interventions reduced the rate of falls but not the risk of falls (Gillespie et al., 2012; Stubbs, Brefka, & Denkinger, 2015). However, the challenges involved with the implementation of multifactorial interventions such as the knowledge deficits of health professionals in assessing and managing the interventions for individuals and the cost-benefit of such approaches, were questioned by other researchers (Tinetti, Gordon, Sogolow, Lapin, & Bradley, 2006). A meta-analytical

study showed that targeted single factor intervention was equally as effective as multifactorial interventions and as cost-effective at a population level, too (Campbell & Robertson, 2007). Key interventions that have proved effective for falls risk reduction of modifiable risk factors and are included as content in education interventions are discussed below.

2.3.2.1 Improving postural instability and balance

Targeted exercise interventions which improve balance can significantly reduce the rate of falls, reduce the risk of falling, fear of falling and depression, according to several systematic reviews (Gillespie et al., 2012; Kendrick et al., 2014; Petridou, Manti, Ntinapogias, Negri, & Szczerbinska, 2009). Two hour minimum exercise per week involving a balance component at a moderate to high level of challenge, conducted on a group or home-basis, has been shown to be effective in the research literature (Sherrington, Tiedemann, Fairhall, Close, & Lord, 2011; Sherrington et al., 2008). Randomised controlled trials have shown that Tai Chi exercises (single strategy) can significantly improve balance in older adults (Voukelatos, Cumming, Lord, & Rissel, 2007) and significantly reduce the risk of falling (Gillespie et al., 2012).

As identified earlier maintaining gait stability can be enhanced with the use of walking aids by community-dwelling older adults and so potentially prevent falls (Graafmans et al., 2003; Hardi et al., 2014). However, there can be challenges when older adults do not have a medical or health professional consultation to advise regarding aid usage and do not receive appropriate training. Challenges are further compounded when more than one aid is used or adherence to recommended use is not adhered to.

2.3.2.2 Improving or managing visual impairment

Interventions for managing risks relating to impaired vision have been varied and outcomes inconsistent (Gillespie et al., 2012). A multifactorial intervention involving eye assessment and eye-care via a health professional was found to be ineffective in reducing falls (Day et al., 2002). Undergoing cataract surgery for the first eye significantly reduced the rate of falls by 34%, and enhanced the participants' general health status (Harwood et al., 2005). In comparison, a subsequent study found that there was no significant reduction in the rate of falling among participants that underwent cataract surgery for the second eye

(Foss et al., 2006). There is evidence indicating that corrective lenses need careful consideration. One study found that multifocal lenses contribute to 35.2% of falls generally, and 40.9% of falls outside the home (Lord, Dayhew, & Howland, 2002). This may be because multifocal glasses affect the older adults' depth perception, edge contrast sensitivity, and the judgement of safe foot clearance (Johnson, Buckley, Scally, & Elliott, 2007). Hence, the ability to detect obstacles may be affected using multifocal glasses, which increases the risk of falling and tripping (Lord et al., 2002; Menant, St George, Sandery, Fitzpatrick, & Lord, 2009). A randomised controlled trial demonstrated that a switch to single-lens glasses as a falls prevention strategy may be beneficial when walking, engaging with outdoor environments or negotiating unfamiliar surroundings (Haran et al., 2010; Haran et al., 2009).

2.3.2.3 Managing foot/ankle issues: Podiatry and footwear

Appropriate footwear and/or podiatry intervention can positively influence balance and so reduce the risk of falling (Koepsell et al., 2004; Menant, Steele, Menz, Munro, & Lord, 2008a, 2008b). One systematic review suggested that shoe design and footwear characteristics such as low heels at less than 4.5cm, firm slip-resistant soles and a high heel collar, enhanced balance in older adults (Menant et al., 2008a, 2008b). Another study showed that athletic shoes are the preferred footwear to manage the risk of falls (Koepsell et al., 2004). Anti-slip footwear has been shown to reduce the risk of falls outdoors in icy weather in community-dwelling older adults with a history of falls (McKiernan, 2005). Regarding disabling foot pain in community-dwelling older adults, a randomised controlled multifaceted (multiple) podiatry intervention was found to be effective in reducing the number of falls by 36% (Spink et al., 2011). The intervention included footwear assessment and advice, customised insoles, standardised foot exercises as well as a generic falls prevention education booklet. However, as with other previously cited studies, researchers here too reported issues with uptake and adherence to various aspects of their recommendations (Spink et al., 2011).

2.3.2.4 Managing medications

Research evidence investigating medication-related falls in older adults proposed a conservative approach regarding the prescription of high falls-risk medication (Hill & Wee, 2012; Huang et al., 2012). The recommendation was to avoid

prescribing long-term use of a medication in favour of starting with the minimal effective dose over a limited time duration, monitoring for adverse effect and withdrawing of the medication whenever possible (Hill & Wee, 2012; Huang et al., 2012). In addition, wherever possible, alternative non-pharmaceutical options to the presenting problems were encouraged (Hill & Wee, 2012). A cross-sectional randomised controlled trial found that self-medication assessment by older adults with follow-up medication review by doctors educated by trial pharmacists significantly reduced the risk of falling in the intervention group (Pit, Byles, & Cockburn, 2007).

2.3.2.5 Managing environmental home hazards

Studies and systematic reviews have found positive outcomes in falls prevention with home modifications (Campbell et al., 2005; Clemson, Mackenzie, Ballinger, Close, & Cumming, 2008; Gillespie et al., 2012; Letts et al., 2010; McLean & Lord, 1996; Nikolaus & Bach, 2003; Pighills, Torgerson, Sheldon, Drummond, & Bland, 2011). The reduction of environmental and home hazards has been found to decrease the number of fallers and the rate of falling in community-dwelling older adults (Clemson et al., 2008; Gillespie et al., 2012). It has been shown to reduce the risk of falling in the cohort of community-dwelling older adults who are at an increased risk of falling (Clemson et al., 2008; Gillespie et al., 2012; Lord et al., 2006). This can be achieved through a home safety assessment by an occupational therapist with consequent home modification (Cumming et al., 1999; Gillespie et al., 2012; Lord et al., 2006; Nikolaus & Bach, 2003). Other studies have found that subgroups of older adults with visual impairment (Campbell et al., 2005; Clemson et al., 2008); and physical impairment (reduced lower limb sensation and strength) (McLean & Lord, 1996), also benefitted from a modification in environmental hazards.

2.3.2.6 Other interventions

Supplemental Vitamin D in the presence of Vitamin D insufficiency, withdrawal of sleeping medications, and pacemakers are effective interventions for reducing falls (Bischoff-Ferrari et al., 2009; Campbell, Robertson, Gardner, Norton, & Buchner, 1999; Gillespie et al., 2012). However, these interventions are usually managed by a medical doctor and as such will not be discussed. We focussed on the

interventions that older adult can initiate and modify themselves. Education as an intervention will be discussed in Section 2.6.3.

2.3.3 Section summary

In summary, falls among older adults are a serious health and social problem for the older adult and the broader community. Between 25-29% of community-dwelling older adults fall at least once a year. The cost and consequences of falling are substantial and have a wide-ranging impact on not only the physical, but also social and psychological well-being of the older adults who experienced a fall(s). There is compelling evidence elucidating what the falls-related risk factors are for falling and evidenced-based strategies have been recommended for community-dwelling older adults. There is established evidence that multi-targeted or individual strategies including regular exercise, addressing the environment, optimising vision and controlling medication are key strategies that can reduce an older adult's risk of falling.

2.4 Older Adults' Engagement in Falls Prevention Programs

Section 2.3.2 discussed the diversity of evidence-based strategies to prevent falls in older adults. Adherence in the present research is defined as the extent to which a participant is willing to follow, and actively cooperate with a recommended practice (Probstfield, 1989). Such adherence is necessary to reduce falls or the risk of falls and may include undertaking exercise, removing home hazards, and following medical advice to reduce high falls risk medication. Adherence rates vary between single and multifactorial interventions, between different single interventions such as home modification and exercise, and within the same intervention such as different exercise interventions (Nyman & Victor 2012; Simek, McPhate, & Haines, 2012). The success and efficacy of falls prevention interventions, be it single or multifactorial, has been limited by the extent of the uptake and adherence to such interventions by the older adult population (Hill, 2009; World Health Organisation, 2007). In other words, studies examining adherence suggest that there has been only limited translation of this research evidence into practice.

A review of 99 community-based randomised controlled trials summarised the limited uptake and adherence of falls prevention interventions by older adults

(Nyman & Victor, 2012). The median recruitment rate for accepting an invitation to participate in falls prevention interventions evaluated in the clinical trials was 70%, the median attrition rate of participants completing the intervention at the 12-month follow-up was 10% and the overall level of adherence across all trials was 80%. However, twelve months after the clinical trials finished, it was estimated that the average participation and adherence to falls prevention interventions had fallen to 50.4% (Nyman & Victor 2012).

Although there is strong evidence showing that engaging in exercise is an effective falls prevention strategy, uptake of this intervention has been proven limited. Community-dwelling older adults have been shown to have low awareness and knowledge regarding exercise requirements to minimise falls (3% out of 333 participants surveyed (Hill, Hoffman, Beer, et al., 2011)). Australian data demonstrate that older adults have low levels of engagement in physical activity including exercise (Armstrong, Bauman, & Davies, 2000; Hackney & Wolf, 2014; Stubbs et al., 2015).

Home modifications to reduce hazards are most effective for older adults at risk of falls and when prescribed by an occupational therapist (Clemson et al., 2008; Gillespie et al., 2012; Pighills et al., 2011). However, the effect of reducing environmental hazard risks has been found to be variable on falls outcomes, as it is also dependent on the uptake and engagement of the older adult in adopting the recommended modifications. For example, one study found that while 75% of older adults adhered to using a non-slip bathmat, only 19% added a rail to external stairs at the study's 12-month follow-up (Cumming et al., 1999). Therefore, researchers have suggested that the efficacy of this falls prevention strategy is dependent on the ability of the health professional to engage the individual older adult to implement recommendations (Clemson, Cusick, & Fozzard, 1999; Lord et al., 2006).

A pilot study showed that though there was success in reducing the risk of medication-related falls, participants' adherence with reduction or complete withdrawal of high-risk medication can be challenging (Campbell et al., 1999). Such challenges were identified as finding appropriate support to help participants wean off the medication and adhere to permanent withdrawal of the medication (Campbell et al., 1999).

Moreover, when presented with falls prevention strategies, studies have reported limited uptake of suggested interventions, because prospective participants indicated that the falls prevention strategy offered was not personally relevant or of interest. In one randomised trial, only 11% of the 40,000 community-dwelling older women invited to participate, accepted the invitation to have their balance screened for an assessment of falls risk (El-Khoury et al., 2015). In another cross-sectional study of 5,755 community-dwelling people aged 70 and above, 62.7% of older adult respondents were not interested in participating in any of the different program formats (such as a home visit or telephone consultation) offered for managing concerns about falls (Dorresteijn et al., 2012).

These findings highlight that a large number of older adults are not optimally engaged in falls prevention strategies. Neither are they actively seeking out nor receiving information about falls and suitable falls prevention strategies. Such data highlights the need to understand why there is resistance to accepting information and subsequent uptake of and adherence to falls prevention strategies. Accordingly, the present research is focused on investigating a specific intervention that may impact on older adults' knowledge and awareness about falls and falls prevention strategies and may motivate and influence behaviour change, namely, greater engagement in and uptake of falls prevention.

2.4.1 Factors influencing older adults' engagement and uptake of falls prevention strategies: Enablers and barriers

The challenge of facilitating older adults' uptake of and adherence to falls prevention interventions may be partly attributable to the diversity of the older adult population. The older adult population is not homogeneous; older adults may possess different perspectives, beliefs and attitudes towards ageing, and may experience varying impacts of ageing on their physical and psychological status (Managing Innovation, 2000; Ory, Hoffman, Hawkins, Sanner, & Mockenhaupt, 2003). Multiple studies have found that epidemiological as well as other factors contribute to older adults' limited uptake of and adherence to falls prevention interventions. The following studies in this section reflect the myriad and complexity of factors that could influence uptake and show that adherence to falls prevention interventions is a complex challenge.

A literature review of older adults' views including their perceptions of factors that facilitate (enablers) and hinder action around falls prevention is reported in this section. Understanding of older adults' views about falls prevention could help translate research evidence to practice in terms of generating greater uptake of the strategies recommended in the Section 2.3.2 (Evidence for reducing falls). For example, if older adults lack knowledge or motivation, these can reduce their uptake of strategies. Factors influencing engagement with and adherence to falls prevention activities, and those limiting uptake, will be also be discussed. Finally, a list of recommended strategies for overcoming identified barriers, and factors enhancing engagement in recommended strategies, will be discussed.

The focus of the initial part of this section is to examine reviews that have investigated community-dwelling older adults' beliefs, attitudes, perceived enablers of and barriers to participation in falls prevention programs. A systematic search of electronic databases was conducted for relevant studies published from January 1995 to current (April 2016). These included Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline and Excerpta Medica dataBASE (EMBASE). Besides using enablers and barriers as key literature search terms, cognate terms and their derivatives, such as the following, were also searched: engage; promote; enrol; participation; motivation; adhere; perspectives; views; compliance; attitudes; attributes, facilitators. The search strategy is presented in Appendix C, Table C.1. Figure 2.1 illustrates the studies/papers screened and reviewed at each step.

Studies could be individual investigations or reviews and were included if they met all of the following criteria:

- They investigated enablers and barriers to older adults' uptake and participation in falls prevention strategies
- Participants were community-dwelling older adults aged 60 years and over

Studies were excluded if any of the following criteria applied:

- They evaluated exercise or other falls prevention interventions to prevent falls but not enablers or barriers to participants completing their interventions
- They were reviews of mainly hospital or residential-based studies and did not include community-based studies
- They only reviewed risk factors for falling
- They were falls-related guidelines, taxonomy or protocols

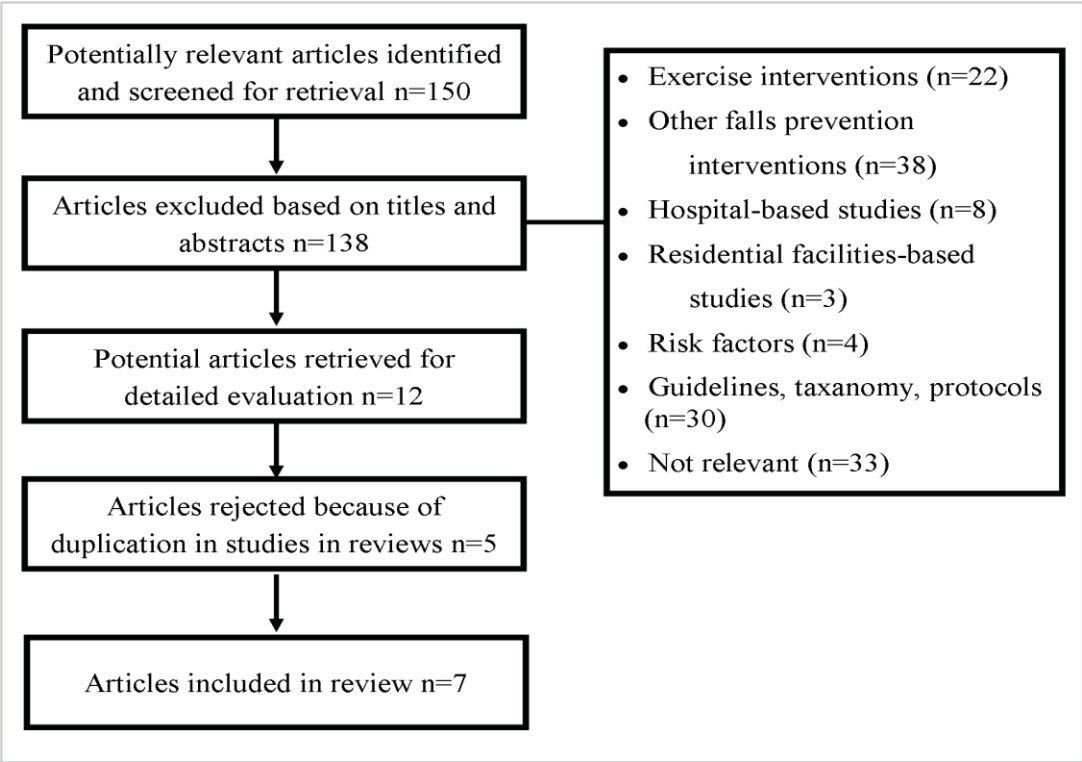

Figure 2.1 Flowchart of Articles Screened, Evaluated and Included in the Review of Enablers and Barriers in Falls Prevention (Community-Based)

Key information about the selected studies or reviews relevant to this research are summarised in Table 2.1. Full details of the studies such as research design and aim(s), a brief description of the sample, and research setting and critique are described in Appendix C, Table C.2. The studies included seven mixed methods studies (including systematic reviews): (Bunn et al., 2008; Dollard, Barton, Newbury, & Turnbull, 2012; Elskamp, Hartholt, Patka, van Beeck, & van der Cammen, 2012; McInnes & Askie, 2004; McInnes, Seers, & Tutton, 2011; McMahon, Talley, & Wyman, 2011; Shaw, Connelly, & McWilliam, 2014). Of the seven studies included in the synthesis of findings reported, four were qualitative studies. Three of them used qualitative approaches (semi-structured/in-depth interviews) and one was a review of qualitative studies (McInnes et al., 2011).

When examining these studies, the quality of the included systematic reviews was assessed against the PRISMA checklist (Liberati et al., 2009) while the qualitative studies were assessed against the Critical Appraisal Skills Program (CASP) qualitative research checklist (CASP, 2014; Kitto, Chesters, & Grbich, 2008). Three of these studies reported results from a mixed-setting of community-dwelling older adults and older adults living in residential care or residing in hospitals. Therefore, for these

studies (Bunn et al., 2008; McInnes & Askie, 2004; McInnes et al., 2011), it was not possible to differentiate the data source in terms of residency status. The difficulty in synthesising these findings from heterogeneous methodological and theoretical approaches (if any) was also compounded by the varying quality of the studies. Of the seven mixed methods studies, the quality of the studies varied as shown in Table 2.1. For example, two of the studies did not describe participants' profiles or report the number of those who refused to participate or the reason for doing so (Dollard et al., 2012; Elskamp et al., 2012). Three of the qualitative studies that were rated by the CASP checklist fulfilled 80% of the criteria (Table 2.2), demonstrating procedural and theoretical rigour.

Table 2.1 Summary of Included Studies on Factors Influencing Older Adults' Engagement and Uptake of Falls Prevention Strategies

Author	Design	Number of studies included	Setting	Comments
McInnes 2004	Systematic Review (24 studies)	RCT (n = 3); Cross-sectional (n = 4); Systematic review (n =1); Narrative review (n = 3); Pre-post (n = 3)	1 residential care, 3 hospitals, 20 community (mixed setting)	Explicit inclusion and exclusion criteria provided; screening assessment information about main study designs provided in detail; described how reliability was established for data synthesis process. Meta-analysis of data not performed. Recommendations were relating to participation in a falls prevention program and did not relate to intention or transition for behaviour change in day-to-day life and activities
Bunn 2008	Systematic Review (24 studies)	Qualitative (n = 12); RCT (n = 2); Cross-sectional (n = 6); Evaluation (n = 2); Process evaluation (n = 2)	18 community, 1 combined community and residential care, 3 residential care, 2 hospitals (mixed setting)	Inclusion criteria stated; search strategy described in detail Qualitative studies were rated against seven criteria ranging 3.5-7.0. Authors acknowledged the lack of assessment tools for qualitative studies in systematic reviews Challenges described and study addressed what and how to promote participation in falls prevention amongst older adults; focussed on beliefs and attitudes as basis for examination of actual behaviour in participation
McMahon 2011	Literature Review (19 studies)	Qualitative (n = 11); quantitative (n = 7); Mixed methods (n = 1)	Community	Search keywords provided; flow chart of inclusion/exclusion diagram was provided; process to establish trustworthiness of the study was described. Evaluations of quantitative and qualitative studies was based on authors' published criteria. Enablers and barriers related to participation in falls prevention programs. Did not provide factors for translation to day-to-day living or behaviour change

Author	Design	Number of studies included	Setting	Comments
McInnes 2011	Qualitative Meta-ethnography		Community Residential care Hospital (fallen outside of hospital) (mixed setting)	Reflected procedural rigour with search strategy; explicit inclusion and exclusion criteria, screening flowchart provided; theoretical framework of meta-ethnography stated; reflected interpretative rigour of findings with inter-rater reliability reported and triangulation
Elskamp 2012	Qualitative Telephone-structured interviews	15 interviews with those who refused to participate in the RCT	Emergency Department	Number of those who refused to participate in the interviews was not known. Participants' profiles were not described. Process of data analysis, that is, who and how the data was analysed was not described
Dollard 2012	Semi-structured interviews	6 females, 3 males	Community-dwelling	Defined the term 'fall' used in study. Recruitment strategy described explicitly. Reasons for refusing to participate is not known. Reflected reliability with audit trial, triangulation of findings with another investigator
Shaw 2014	Qualitative Phenomen-ology Via in-depth interviews	7 females, 2 males	Community-dwelling	Recruitment strategy described. Participants' profile described Interviews were recorded and transcribed verbatim. Reflective memos were used. Findings were credible and consistent with literature

Table 2.2 Quality Assessment of Included Qualitative Studies

Studies		Procedural rigour		Interpretative rigour	
Authors	Authors' position stated (Aim)	Sampling strategy described and justified	Data collection described adequately	Data analysis[a]	Respondent validation (e.g. member checking)
McInnes 2011	✓	✓	✓	✓	✗
Dollard 2011	✓	✓	✓	✓	✗
Elskamp 2012	✓	✗	✗	✗	✗
Shaw 2014	✓	✓	✓	✓	✗

Assessment checklist adapted from Critical Appraisal Skills Programme (CASP) Qualitative Research Checklist (CASP, 2014; Kitto et al, 2008)

[a]Data analysis and interpretation described and if any control measures used

2.4.2 Synthesis of recommendations

The findings of the studies in this section's literature review were interpreted and synthesised using the meta-ethnographic approach (Noblit & Hare, 1988). This inductive approach involved interpreting and translating the concepts relevant to the focus of this research followed by an analysis and comparison of the translations.

The synthesis of the included studies identified that there were multiple enablers and barriers to engagement. Barriers that were identified at the individual level included low levels of knowledge and poor physical health. Barriers that were related to social influences included perceived negative self-identity or were dependent on community/external parties (other elements such as cost of attending a program). The final synthesis of the translations and recommendations can be found in summary form in Table 2.3.

While these studies provided detailed findings about the barriers and enablers to engaging in falls prevention, it is unclear which enablers were more important and if there was a factor central to facilitating a positive change towards the desired behaviour. In addition, there were few recommendations made regarding encouraging older adults to initiate and maintain engagement in falls prevention programs. Importantly, although some researchers focused on how falls prevention messages should be delivered there is limited published evidence and guidance regarding a framework on how to engage with older adults regarding falls prevention on a population level. A workable strategy using health education to encourage engagement will be discussed in the following Section 2.5.1.1

Table 2.3 Synthesised Summary of Older Adults' Views and Recommendations Derived from the Studies in Table 2.1

Elements	Views (Barriers)	Recommendations from studies (Enablers)
Knowledge	Lack of knowledge about falls prevention. Unfamiliar with the term "falls prevention". Inaccessible and unappealing information Falls inevitable with ageing	Information from a variety of sources besides general practitioner. Information in different languages. Information that falls can be prevented. Information to address fears and beliefs e.g. fear of falling, low self-efficacy. Foster high self-efficacy
Social norms Social influence	Social stigma associated with falls	Promote positive self-identity and benefits of participating in fall prevention programs such as maintenance of independence. Emphasise positive social experience of participating e.g. fun, motivating, trusting social atmosphere
Social identity	Identity of physical incompetence and aging (Negative self-identity)	Interpersonal, organisational and community level of support to influence older adults' decision to participate. Partner with a peer who had a positive experience
Relevance	Not personally relevant	Promote and communicate life-enhancing benefits such as maintenance of independence and control
	Perceived low personal relevance of falls prevention	
Low motivation	Falls are beyond personal control Rationalise away risk such as it's a trip and not a fall	Promote and communicate life-enhancing benefits such as maintenance of independence and control
Generic information	Mismatch in expectation, not client-focused to needs of older adults	Finding out what older adults prefer and are willing to accept to address their needs and empower them. Tailored information instead of "one size fits all" advice
Others	Poor health; Limited mobility; Possess a limiting health condition	Not described in any of the studies
	Poor transport options; Cost and convenience	Convenient scheduling/reasonable pricing/good access to transport

2.4.3 Section summary and critique of findings

Previous research has found that older adults have low levels of knowledge and poor understanding about the problem of falls and falls prevention (Hill, Hoffman, Beer, et al., 2011; Managing Innovation, 2000; Snodgrass, Rivett, & Mackenzie, 2005). Studies have highlighted that some older adults choose not to engage in falls prevention strategies despite having an awareness of the possibility of falling. Factors contributing to this may include a low personal relevance and motivation (Managing Innovation, 2000). Given the accumulated body of evidence about what works in falls prevention, there appears to be a problem with the communication between researchers and health professionals, or with older adults themselves that would promote older adults' engagement in falls prevention programs. Moreover, recommendations for improving engagement and uptake of falls prevention strategies by older adults appear to be insufficiently comprehensive and generally unstructured. Such a largely unstructured approach differs substantially from the coherent framework of implementation strategies offered by behaviour change theories that will be described in the following section. When considering the complexity of the problem of older adults' low levels of engagement in falls prevention, incorporation of a theoretical framework may facilitate the translation of evidence-based falls prevention interventions into practice. The aim of the present research then, is to design, develop and evaluate a program guided by a theoretical framework and a review of the literature to identify the enablers and barriers to engagement in falls prevention, in the light of relevant adult learning principles, to be presented in Chapter 7.

2.5 Providing Education-based Interventions to Reduce Falls

This section will critically review the evidence for providing education-based interventions for reducing falls. Studies from hospital settings will be included as these provide evidence for how the design of falls prevention education might be applied in community-based settings. Since peer education is the focus of the research conducted for this thesis, a discrete review of peer-led education for falls prevention will be presented in Section 2.6.3.

2.5.1 Rationale for providing education for older adults as an intervention to reduce falls

In the previous sections, a gap between the research evidence and its translation into practice regarding the target population (older adults) was identified. Research evidence demonstrating low levels of engagement, uptake and adherence by older adults in falls prevention was discussed. Barriers and factors limiting engagement in falls prevention strategies were also identified, particularly low awareness or knowledge and low perceived personal relevance. This research proposes that education in falls prevention is a feasible means of addressing the barriers identified and meeting the needs of community-dwelling older adults.

Any health-related education program should essentially use an established health behaviour change theoretical framework as a guide to its design, development, implementation and evaluation. Likewise, an education program for older adults should follow prevailing pedagogical principles for adult learners. This section will describe and discuss relevant framework(s) and principles as well as provide the rationale behind the adoption of the chosen theories to guide the design, development, implementation and evaluation of the falls prevention education program. Finally, the efficacy of falls prevention trials that used education as an intervention will be presented.

2.5.1.1 Health education

In this section, an initial introduction regarding what constitutes health education and health behaviour as applied to falls prevention education will be considered. A review of frequently used theoretical frameworks for designing and providing health education programs as well as a discussion of their strengths and limitations will be undertaken. Subsequently, the rationale for and a justification of the chosen theoretical framework driving the design and evaluation of the intervention used in this research will be provided.

Health education has been described as any planned combination of learning experiences designed to engender motivation towards voluntary behaviour conducive to health in individuals, groups or communities (Glanz, Rimer, & Viswanath, 2008; Green & Kreuter, 2005; Simonds, 1976). Health behaviour has been described as any behavioural activity that seeks to maintain or improve health and well-being (Conner

& Norman, 2005). However, other researchers have proposed that the working definition of health behaviour should consider not only an individual's observable action but also their mental state and personal attributes (Gochman, 1997). Accordingly, attributes such as beliefs, values, perceptions and expectations, which contribute towards health behaviour are also to be considered determinants of behaviour (Glanz et al., 2008; Gochman, 1997). Thus, these aspects ought to be taken into consideration when designing health education falls prevention programs.

It has been suggested that providing health information and education in various forms does not automatically result in health behaviour change (Conner & Norman, 2005), even if the information provided results in an increase in health knowledge (Green & Kreuter, 2005). A thorough understanding of the target recipients and their needs has been found to be fundamental if the delivery of health education is to be effective, that is, result in a change in health behaviour (Rossi, Freeman, & Lipsey, 1999). Researchers (Randolph & Viswanath, 2004) have recommended that a prior understanding of the target recipients' health and social characteristics and behavioural determinants, such as beliefs, is crucial for delivering effective health education. To enhance the likelihood of behaviour change, it has also been recommended that health education be delivered using cognitive psychosocial principles within a defensible theoretical framework (Conner & Norman, 2005; Kok, Schaalma, De Vries, Parcel, & Paulussen, 1996; Randolph & Viswanath, 2004). Use of theories to inform the design and development of health education interventions ought to facilitate its effectiveness, ease of evaluation, reporting of findings and replication of the intervention (Craig et al., 2008; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). However, a systematic review demonstrated that only a minority — 53 out of 235 (22.5%) — of published health research implementation studies from 1976-1999 explicitly drew upon theories of behaviour change (Davies, Walker, & Grimshaw, 2010). A similar trend was shown in a meta-analysis of interventions (studies published between 1990-2008) to improve health-related behaviour change (physical activity and healthy eating), namely, that theory was not used widely and that the extent of use was not well-developed (Prestwich et al., 2014). Though Prestwich et al. (2014) reported that 56.3% of studies explicitly reported the use of theory, only 26.8% used such theory to develop the interventions and only 28.9% discussed their results in terms of their theoretical framework.

2.5.1.2 Behaviour change theories

A theory is a systematically organised body of knowledge about understanding a phenomenon or topic (van Ryn & Heaney, 1992). In the present context, it should be understood as providing a coherent "road map" (Rimer & Glanz, 2005, p. 5) for designing health education research. As such, it offers evidence-based insights into the influences of health behaviour and mediating causal pathways towards behaviour change (Improved Clinical Effectiveness through Behavioural Research Group (ICEBeRG), 2006; Rimer & Glanz, 2005; Rossi et al., 1999). Four theories have been used widely and shown to be effective in the area of health education, peer education, and research involving older adults and/or falls prevention to measure components of health-related behaviours (Haines et al., 2011; Hill, Etherton-Beer, & Haines, 2013; Lorig, Gonzalez, & Ritter, 1999; Lorig et al., 1999; Yardley, Donovan-Hall, Francis, & Todd, 2007). Three theories that are frequently used behaviour change theories have been extensively applied and evaluated in the literature. These are the Health Belief Model (HBM), Theory of Planned Behaviour (TPB) and Social Learning Theory. These three theories have consistently been shown to be amongst the most frequently used theories in health behaviour change (Glanz et al., 2008; Michie et al., 2014; Painter, Borba, Hynes, Mays, & Glanz, 2008). The fourth is the COM-B model which is an implementation theory developed recently (Michie et al., 2011).

First is the Health Belief Model. This is a cognition-based theory for explaining, predicting and influencing acceptance and uptake of health-related behaviour from a set of belief patterns (Rimer & Glanz, 2005; Rosenstock, 1966; Rosenstock, Strecher, & Becker, 1988). The HBM is one of the most widely used theoretical models for designing and evaluating health education interventions (Glanz et al., 2008). HBM proposes that people are most likely to engage in behaviour to reduce a health risk if they believe they are susceptible to that risk, the consequences are serious, and the benefits of taking action outweigh the cost (Janz & Becker, 1984). There are six major constructs that are conceptualised as informing an individual's motivation to change their behaviour to reduce a health threat (Table 2.4). These relate to the individual's perception and cost-benefit analysis of the health threat (Abraham & Sheeran, 2005; Rimer & Glanz, 2005; Rosenstock, 1966). While a cognitively-based theory conceptualising how an individual perceives a health threat provides

insights into explaining determinants of behaviour, some researchers have suggested that HBM is limited because there is no standardised conceptualisation of the model and its constructs. Additionally, the HBM does not consider the other influences of health behaviour such as social, affective or emotional aspects (Abraham & Sheeran, 2005; Champion & Skinner, 2008).

Second is Bandura's Social Learning Theory (1977a), later refined as the Social Cognition Theory (2001), which has been more recently conceptualised as an extended cognition-based theory (Rimer & Glanz, 2005). Besides considering cognitive factors, Rimer and Glanz (2005) propose that environmental and personal factors also influence behaviour. The core construct of this cognition-based theory, *perceived self-efficacy*, is a "conviction that one can successfully execute behaviour required to produce the outcomes" (Bandura, 1977a, p. 193). Essentially, self-efficacy is an individual's belief in his/her own effectiveness to cope in each situation. Self-efficacy has been deemed a major determinant for adopting and sustaining target health promotion behaviours (Bandura, 1977a, 2000; McAlister, Perry, & Parcel, 2008). While self-efficacy has been shown to influence participants' behaviour (Booth et al., 2000; Barbara Resnick, 2001), other researchers have found that it is not the only determinant of behaviour. Other proposed determinants have included sociodemographic status (such as age); perceived risk, lack of knowledge, perceived barriers (such as pain during physical activity) and physical opportunity (physical and mental health) (Clark, 1999; Conn, 1998; Grembowski et al., 1993; Resnick, 2001).

Similar to HBM, the third theory, the Theory of Planned Behaviour (TPB) is also a cognitive-based theory designed to explain the psychological determinants that influence an individual's processing of information and predicts an intention to engage and perform a behaviour (Ajzen, 1985). Intention is central to this theory and Ajzen (1991) described intentions as motivational factors that explain the level of resolve people possess in performing a behaviour. The theory proposes that intentions precede behaviour, and are determined by attitudes towards the behaviour, social network and one's self-belief, to the extent to which one has control over the behaviour. Apart from attitudes and self-belief, the third determinant is the existence of both internal and external factors. Internal (intrinsic) factors include the individual's skills, knowledge, and resources; whereas external (extrinsic) factors are barriers and dependence on

others. Intrinsic and extrinsic factors will be elaborated in Section 2.5.1.3.1: Adult learning. Overall, the theory proposes that the more favourable the determinants of behaviour, the more the likelihood of an individual's intention to perform the behaviour (Armitage & Conner, 2001). Similar to HBM, TPB theory does not address the influences of emotional processes or impulsivity. It has been argued that although TPB theory has been used to explain prediction of behaviour change, it does not demonstrate how to change the identified behavioural determinants (Michie, 2008). While TPB is one of the most frequently used behaviour change theories, a systematic review of 30 published studies (including 14 RCT studies) concluded that TPB was rarely used to design, develop and evaluate interventions (Hardeman et al., 2002).

Fourth and final is the COM-B model. COM-B is an acronym for Capability, Opportunity and Motivation affecting Behaviour. The COM-B model was originally developed from a consensus meeting of behavioural theorists who reviewed existing theories of behaviour (Michie et al., 2011). It has subsequently undergone further testing and development (Cane et al., 2012; Cane, Richardson, Johnston, Ladha, & Michie, 2015; Jackson, Eliasson, Barber, & Weinman, 2014; Steinmo, Fuller, Stone, & Michie, 2015). It is a theory that translates the concepts to practice in that it provides strategies, identifies important factors such as barriers, suggests mediating causal pathways for potential behaviour change, and offers a basis for evaluation of outcome measures (Improved Clinical Effectiveness through Behavioural Research Group (ICEBeRG), 2006; Rimer & Glanz, 2005). The COM-B model hypothesises that behaviour is influenced by three core constructs and any required change in health behaviour will be dependent on changing any of these constructs (Michie et al., 2014), namely,

- Capability. Physical (skill, strength, stamina) or psychological (knowledge, comprehension, reasoning) capacity to perform the behaviour
- Opportunity. External factors that prompt enactment of the behaviour. Physical opportunity (time, financial resources, cues) or social opportunity (cultural environment)
- Motivation. Processes that energise and drive behaviour. Reflective processes (evaluation, plans) or automatic processes (emotions, habits, impulses)

The COM-B model requires a prior understanding of the target recipients of the intended behaviour change intervention at the initial design stage. The COM-B model can then be used to identify which determinants of behaviour (constructs) need to be changed once the target behaviour change has been determined (Jackson et al., 2014). The constructs are seen as dynamic by the designers of the COM-B model, that is, they may interact with and influence each other or the target behaviour (Michie et al., 2014). After identifying the pertinent constructs, the COM-B model can be expanded and used jointly with the Theoretical Domains Framework in practice. The latter is a framework that has 128 explanatory constructs identified from 33 behaviour change theories.

While the Theoretical Domains Framework allows for researcher or educator benefits, barriers to its use include that users may require training or a background in behavioural theory to understand how to apply the health psychology concepts (Francis, O'Connor, & Curran, 2012). Despite its application across a range of settings, it has been noted that in a review of 21 Theoretical Domains Framework based studies, that 17 of them utilised the Theoretical Domains Framework primarily in conceptual design and implementation of health professionals' behaviour change in clinical or professional settings (Francis et al., 2012). None of the studies included used the COM-B model or the Theoretical Domains Framework and their constructs directly applied to an intervention to be delivered to older adults in the community by volunteers instead of health professionals (Francis et al., 2012). Health professionals may be able to conceptualise health psychology concepts more easily than lay volunteers.

A brief summary and comparison of the four behaviour change theories discussed in this section is presented in Table 2.4.

Table 2.4 Summary and Comparison of Four Theories: Insights to Determinants of Behaviour Change for Falls Prevention

Name	Health Belief Model	Social Cognition Theory	Theory of Planned Behaviour	COM-B and TDF
Brief summary	People are likely to engage in behaviour to reduce a health risk if they believe they are susceptible to the risk, the consequences are serious and benefits of engaging in the behaviour outweigh the cost	Environmental and social factors can influence behaviour	Intention precedes behaviour and is determined by three constructs	Aims to understand behaviour in the context it occurs. Behaviour change is influenced by changing any or combination of its three constructs
Constructs	Perceived susceptibility Perceived severity Perceived benefits Perceived barriers Cues to action Self-efficacy	Perceived self-efficacy Outcome expectancies	Attitudes Subjective norm Perceived behavioural control	Capability-physical; psychological Opportunity-physical; social Motivation-reflective; automatic
Relationship between constructs	Variable, dependent on the behaviour measured and health context. Perceived benefits and barriers are strongest predictors	Not described	Not described	Been described as interactive, dynamic amongst the three constructs and behaviour but extent not described nor investigated
Benefits and challenges to use	Extensive use throughout health fields of research to design and measure interventions. Does not consider affective/emotional aspects or influences on behaviour	Evoked by personal mastery, observation or modelling, persuasion, and emotion. Does not consider other aspects such as physical capacity as determinants of behaviour	Effective to predict and explain behaviour but not commonly used to design, develop and evaluate interventions	Provides the hypothesis to change behaviour. Is inclusive of affective/emotion construct. Users require training to understand complex coding involved and assumes researcher has resources to implement all aspects of behaviour from individual to organisational level

COM-B: Capability, Opportunity, Motivation-Behaviour Model; TDF: Theoretical Domains Framework

Changing an established health behaviour or engaging in a new health behaviour is a complex process which is not only dependent on factors related to the individual concerned, but also to other factors as highlighted by the major theories of behaviour change discussed in this section. While HBM, TPB and Social Cognition Theory have provided evidence-based insights into influences on behaviour, predicting behaviour and suggesting potential mediators for behaviour change, they have some limitations in their theoretical and conceptual coverage. They are mainly cognitive-based theories and have been conceptualised using cognitive constructs such as knowledge, beliefs and attitudes. Researchers have suggested the underlying concepts of these health theories is that they ascribe people's behavioural decisions as being motivated by practical yet simplistic cost-benefit analysis (Buchanan, 2000). As such, the concepts do not reflect crucial constructs of health behaviour such as habits or emotional influences that can drive people's behaviour, as seen in the barriers and enablers of older adults' uptake of falls prevention strategies, described in Section 2.4. Therefore, these theories are limited in meeting the needs of this current study that requires the knowledge and causal mechanisms (techniques) to guide and inform the design and implementation of an intervention.

The COM-B model and Theoretical Domains Framework combination renders a pragmatic yet comprehensive and coherent conceptual coverage of influences on behaviour (Cane et al., 2012). Together with their strategies to translate concepts to practice, validated framework, and validated evaluation measures, they are particularly advantageous for the implementation needs for the studies in this research (Cane et al., 2012; Francis et al., 2012; French et al., 2012). Their combination can be used at the individual or group level (Michie et al., 2014). This view is supported using the COM-B and Theoretical Domains Framework approaches in a wide range of medical related clinical behaviour implementation research discussed earlier, such as midwives advising smoking cessation behaviour, and health professionals' adherence to low back pain guidelines (Beenstock et al., 2012; French et al., 2013).

In summary, all the theories discussed contribute to the review and critique of research exploring education interventions in falls prevention in the later section of this chapter. However, for the present research, the COM-B model together with the Theoretical Domains Framework will be used within an overarching behaviour change

framework as it allows for the development, design, implementation and evaluation of a peer-led falls prevention education intervention, which will form the second phase of this research.

2.5.1.3 Overview of the principles underpinning the provision of adult education

Although it is beyond the scope of this thesis to review all research evidence pertaining to adult learning and educational theories, the principles relevant to falls prevention in older adults are worthy of consideration. Those principles for evaluating the instructional design of falls prevention education interventions will be discussed. This includes peer-led falls prevention programs. The following section briefly examines how adult learning and teaching strategies could be used to facilitate falls prevention education.

2.5.1.3.1 Adult learning

Learning is a complex behaviour (Merriam & Bierema, 2014) and can be defined as a process that "leads to a change in human disposition or capability that persists over a period and is not simply ascribable to processes of growth" (Gagné, 1985, p. 2). The learning process, and hence learning outcomes, may be influenced by physical, psychological, social and cultural dynamics (Merriam & Bierema, 2014). Learning itself may lead to a change in affective dimensions (attitude or emotion), psychomotor or overt dimensions (physical skill or capacity) or cognitive (knowledge) capacity (Anderson, Krathwohl, & Bloom, 2001). Hence, learning will be reflected in "how we think, feel and act" (Merriam & Bierema, 2014, p. 41).

Investigation into learning and teaching has found that because children and adults learn differently (Inhelder & Piaget, 1958), understanding the model of *andragogy* may be useful (Knowles, 1970; Knowles, Holton III, & Swanson, 2005). Andragogy has been defined as the "art and science of helping adults learn" (Knowles, 1970, p. 38). There is no universal theory that encompasses the myriad of influences on how adults learn or that include all the types of learning (Fenwick & Tennant, 2004; Merriam, 1987), and as such, multiple perspectives have been found to contribute to adult learning (Fenwick & Tennant, 2004; Merriam, 1987).

Knowles and Associates (1984; 2005, p. 63) have suggested that there are six crucial assumptions regarding the characteristics of adult learners. Briefly, these are:

1. The need to know. Adults need to know the reason and value for learning something
2. Self-directed in learning. Adults develop a self-concept of being responsible for themselves, hence, are self-directed learners
3. Prior experience. Adults bring a wealth of experience to their learning compared to youths
4. Readiness to learn. Adults engage in a learning activity when they see it has personal relevance and hence, develop a drive to solve their real-life issues
5. Orientation to learning. Adults are task or problem-centred when learning, using their learning to help them deal with life issues
6. Motivation. Adults are intrinsically motivated

By understanding how adults learn, educators can more effectively plan and design instruction, incorporate efficacious learning strategies and provide appropriate resources to foster both learning processes and outcomes for adults (Foley, 2004). This is important for facilitating learning, for as was shown in Section 2.4.1, many older adults have low levels of interest in learning about falls prevention as they see this as not being personally relevant. Moreover, as previously discussed, studies have found that older adults have reported that the information provided to them was often unclear, used unfamiliar terms and was unappealingly presented (Bunn et al., 2008; Dickinson, Machen, et al., 2011; Hill, Hoffman, Beer, et al., 2011; Snodgrass et al., 2005).

Although valuable, ongoing research in the field of education has found that the andragogical model does have certain limitations of which the researcher needs to be aware. Specifically, researchers have concluded that it cannot control for factors such as the adult learners' extrinsic motivation; information processing capacity in learning; the personal influence of the educator; and the capacity for self-reflection by adults (Abela, 2009). Nor can it predict potential influences (e.g. personal or societal) on the adult (Merriam & Bierema, 2014). Such factors are largely motivational in nature. Motivation has been defined as "a hypothetical construct to explain the initiation, direction, intensity and persistence of goal-oriented behaviour" (Good &

Brophy, 1990, p. 360). Gagné (2005) has concluded that learner motivation be considered in designing the instruction of a program.

Motivation can be either intrinsic or extrinsic in nature (Merriam & Bierema, 2014). *Intrinsic motivation* is seen as the self-desire and drives to seek and accomplish an activity solely for the inherent satisfaction of the activity itself rather than an external pressure or reward (Ryan & Deci, 2000). One of the factors that may engender intrinsic motivation for learning is fostering a sense of competence or self-efficacy as previously discussed (Ryan & Deci, 2000). In contrast, *extrinsic motivation* is accomplishing an activity to achieve outcomes external to the individual such as recognition or approval from others (Gagné, 2005; Merriam & Bierema, 2014). Wlodkowski (2008, pp. 46-47) further theorised that there are four main motivational conditions that need to be addressed during adult learning, namely, (i) inclusion, (ii) developing attitude, (iii) enhancing meaning, and (iv) engendering confidence. Wlodkowski (2008) proposed that addressing these conditions in an instructional design plan can enhance the learning experience and ultimately, should evoke intrinsic motivation within the learners. This is particularly relevant to the present research as studies (Section 2.4.1 Factors influencing older adults' engagement and uptake of falls prevention strategies) have shown that low personal control, confidence to manage the risk of falling (deemed inevitable) and low motivation to learn are barriers to generating intrinsic motivation to engage in falls prevention actions.

Table 2.5 presents a combined summary of key findings from the work undertaken by Knowles & Associates (1984), Merriam & Bierema (2014) and Wlodkowski (2008) as far as these relate to the principles of motivation and adult learning; design and concepts of an adult education program; and concepts as applied to falls prevention for older adults. Such a summary provides, from an andragogical perspective, the theoretical underpinning of the present research. This will further be complemented by insights from the work of Bloom (1956).

Table 2.5 Summary of the Research of Knowles & Associates, Wlodkowski, Merriam & Bierema Applied to Falls Prevention Education

Principles of motivation and adult learning	Design and concepts of an adult education program	Concepts as applied to falls prevention for older adults
Recognise adults are self-directed learners	Introduce and connect with target audience attractively and clearly	Take account of older adults' previous experience of falls
Encourage adult learners to draw on relevant prior experience as a valuable resource	Provide an opportunity for multidimensional sharing	Ask about prior history or knowledge about falls in an interactive manner
Readiness to learn is related to a need to know	Clearly identify the learning objectives and goals for the session	Respect older adult as a learner not as a student
Learning should be problem-centred	Assess learners' current expectations, needs, goals, and previous experience	Aim to provide knowledge but also to cultivate the skills, foster self-efficacy and influence positive attitudes towards falls related behaviour
Adults learners are intrinsically motivated	Emphasise the purpose of what is being learned and its relationship to the learners' personal lives and current situations	Tailor the falls information to meet goals of the adult and build on their previous experience with falls prevention
Create a comfortable physical/psychological climate conducive for adult learning	Clearly state or demonstrate the benefits that will result from the learning session	Be explicit about the benefits of falls prevention
Create a climate of respect among adults (inclusion)	Build a positive attitude and develop self-efficacy	To use demonstration, pictures, video, or checklists as learning aids during falls prevention program
Engender an awareness and feeling of connection among adults (inclusion)	Provide variety in modes of presentation style and learning materials	Scaffold complex learning by starting with initial introduction to prevalence of falls and progressing to management of falls risks in several stages
Maintain learners' attention (enhance meaning)	While instructing, use scaffolding knowledge, humour and analogies to assist learning	Present falls prevention in a positive tone to undertake and engender confidence in patient/client that they can learn and engage in falls prevention
Develop self-efficacy for learning (attitude)	Use goal-setting methods	Educators to share personal stories and insights relating to falls prevention that older adults can also relate to
Evoke and sustain learner's interest (enhance meaning)	Foster the intention and capacity to transfer learning	
Formulate content that will satisfy learning needs	Provide positive closure at the end	
Engender competence with transfer		

Bloom's two-dimensional taxonomy of the cognitive domain is another perspective recognised as contributing to a better understanding of how individuals process information cognitively and organise knowledge (Anderson et al., 2001; Merriam & Bierema, 2014). The categories of Bloom's taxonomy are organised in a hierarchical continuum of complexity or abstraction (Bloom, 1956). The cognitive process dimension comprised of six categories on a continuum: Remember (least complex), Understand, Apply, Analyse, Evaluate, and Create (most complex). In a falls prevention program, which aims for behaviour change including planning or creating an intention towards change, the challenge is for an educator who may often be a health professional, to help the older adult process and integrate cognitive information towards at least the level of analysis on the continuum. Otherwise, an older adult may understand and retain the information, but not know how to apply the knowledge learned in a meaningful way. Similarly, another aim could be to progress the older adults' knowledge dimension closer towards the more abstract end of the scale, where greater use is made of metacognitive strategies (Table 2.6).

Table 2.6 Bloom's Knowledge Dimension Applied to Falls Prevention Education

Categories of knowledge	Explanation in the context of providing falls prevention education to older adults
Conceptual knowledge	Encompasses an understanding of the interrelationship and function of the basic elements within the structure of the phenomenon; e.g. nature of falls, falls risk factors and strategies that are known to reduce falls
Procedural knowledge	Encompasses knowledge "how to do something", e.g. a series or sequence of steps to assess personal falls risk factors, completing a home risk checklist
Metacognition knowledge (higher level of abstraction)	Encompasses self-awareness, self-reflection and cognition, e.g. problem-solving strategies to manage one's falls risk factor such as how to modify my home environment to make it safer

Adapted from Anderson, Krathwohl, and Bloom (2001)

2.5.1.3.2 Strategies for teaching adults

When providing older adults with a health education program, it is important to keep in mind the overall principles of working with an adult learner. That is, that learning should be undertaken in a conducive environment, remain positive in focus, and be interactive and meaningful (Findsen & Formosa, 2011). As discussed earlier, any information provided should be well-designed, preferably tailored to a specific

audience and be available in various formats (Coulter & Ellins, 2007; Hill, Lowe, & Ryan, 2011). A systematic review of studies involving health behaviour change reported that by providing tailored information, participants demonstrated better retention of information and improved health outcomes (Ryan & Lauver, 2002).

It has also been posited that appropriate pedagogical skills can help in imparting information and actively engaging learners (Merriam & Bierema, 2014). In addition, rich resources such as manuals, books and audiovisual aids have been shown to be a minimum requirement for pedagogy and facilitating the learning of adult learners (Knowles et al, 2005; Spector, Merrill, Elen, & Bishop, 2014). Such resources can provide an enriched learning experience that promotes communication, accommodates transfer of information from the educator to the learners, and aids retention (Dale, 1969; Dale, 1970). Strategies proposed for educators to assist learners and tailor learners' experience include scaffolding knowledge, providing experiential learning, engaging in role-modelling and considering sensory preferences. The strategy of *scaffolding*, pioneered by Vygotsky (1978) has been described as "assisted learning" (Wlodkowski, 2008, p. 183). This process can be described as educators gradually assisting an individual learning to perform a task beyond their personal capacity, until an independent performance has been demonstrated (Jaramillo, 1996; Sanders & Welk, 2005). The educator can tailor the teaching styles, and provide prompts at an appropriate time, amount and pace to suit the individual(s) to build a bridge to new knowledge and foster learning (Wlodkowski, 2008). There is also a social dimension to adult learning (Merriam & Bierema, 2014). Bandura (1977a) proposed that learning occurs by interacting with a teacher or by listening to information presented, but also when an individual interacts with the social environment. Vygotsky (1978) further proposed that influence from educators and collaboration with more competent peers, such as expert models, can guide the individual's socio-cultural learning experience to a higher level of learning outcome (Jaramillo, 1996). Previous qualitative studies have found that older adults are passive about seeking falls prevention information (Lee, McDermott, Hoffman, & Haines, 2013) which suggests that social initiatives could facilitate their engagement in falls prevention. The application of scaffolding and pedagogical skills could potentially improve learning regarding falls prevention, as researchers have found that some falls prevention information imparted was unclear in providing the rationale and benefits of

engaging in falls prevention to stimulate older adults' motivation (Dickinson, Machen, et al., 2011; Yardley, Donovan-Hall, et al., 2006). Finally, it is essential that learning styles are taken into consideration when teaching adults. Learning styles are reflected in how people use their senses to perceive and process information (Fleming & Baume, 2006; Merriam & Bierema, 2014). Frequently cited learning styles that have been described (Fleming & Baume, 2006) are:

- Visual - a preference for information in pictorial, graphical or pattern mode
- Aural - a preference for information by hearing or listening mode
- Read/write - a preference for information in the printed word mode
- Kinesthetic - a preference for information and learning by experiencing with all senses including tactile and by application

Systematic reviews in a variety of health areas have found that high quality online education programs as well as video and personalised classes are more effective for education of people with health conditions, but this has not been trialed in falls prevention. Other fields of health, such as cancer care, have explored modes of learning that were effective in patient education and information dissemination. A systematic review of 16 cancer care studies of 2,318 participants, of which 15 were RCT studies, found video-recording or written summaries improved participants' recall of information and improved satisfaction following medical consultations (Pitkethly, Macgillivray, & Ryan, 2008). Other systematic reviews in cancer care found that multimedia such as video and interactive technology increased participants' knowledge (Gysels & Higginson, 2007; Ryhanen, Siekkinen, Rankinen, Korvenranta, & Leino-Kilpi, 2010). Furthermore, another systematic review investigating different presentations of video-assisted patient education found that modelling seen in enacting specific scenarios was more effective than didactic video presentation in facilitating behaviour outcomes (Abu Abed, Himmel, Vormfelde, & Koschack, 2014).

However, exploration into the use of learning style and preferences for sensory modalities has been limited in falls prevention research. Falls prevention online learning websites were assessed and found to be lacking in providing tailored information, had low credibility and poor coverage of falls-related information (Whitehead, Nyman, Broaders, Skelton, & Todd, 2012). The following section will describe the studies in more detail, but as previously discussed education interventions

in falls prevention involved handing out generic falls prevention printed material, such as pamphlets, which is not an optimal tailoring of the information to be presented (Chang, Huang, & Jung, 2011; Huang, Liu, Huang, & Kernohan, 2010; Rucker et al., 2006). In contrast, a RCT that evaluated falls prevention education using a DVD-media compared to written workbook, found that those participants in the DVD group had significantly increased knowledge and were more confident to engage in falls prevention strategies (Hill et al., 2009). Researchers from areas of falls prevention and cancer care have recommended that the needs and requirements of users be investigated to improve the capacity to provide tailored information in future, and determine which target audience may be suitable for exposure to a specific type of media (Thygesen, Nicolaisen, & Mogensen, 2015; Whitehead et al., 2012).

In summary, some individuals may have a strong preference for one learning style whilst other individuals may be multimodal in their approach to learning (Fleming, 2007). While it may not be possible to address all learning styles and preferences during an education session, educators should be aware of diverse learning preferences among the audience for processing information during the design and development of instruction for an education session (Fleming & Baume, 2006).

2.5.1.3.3 Effect of ageing on adult learning

The central components of adult learning require both integrating sensory input and memory including cognitive processing of learned information. With ageing, the physiological decline in visual and hearing capacity may affect sensory feedback for learning. These changes should be factored into health education programs, such as those that provide falls prevention education for older adults. Over 68% of adults over the age of 80 will have cataracts and over 35% will suffer some form of visual impairment (Rosenthal & Fischer, 2007). The visual capacity such as the ability to detect contrast, colour discrimination, sensitivity to glare or perception of speed have been shown to decline with age (Schieber, 2006). It has also been reported that over 20% of those in their 70s have hearing impairment (Bjorklund, 2011). While intelligence remains generally intact, there is a decline in memory capacity as one ages. *Memory* is the ability to store information for use when needed (Bjorklund, 2011). There is some evidence that older adults tended to become relatively slower and less efficient in both cognitive processing of learned information

(memory) and their capacity to perform multiple tasks simultaneously for higher level executive function, such as reviewing options and decision-making (Old & Naveh-Benjamin, 2008). Therefore, these changes should also be taken into consideration when designing health education for older adults. Concurrently, older adults frequently experience a general decline in health with ageing. Over 85% of people aged 65 and above suffer one or more chronic diseases (Bjorklund, 2011). Together with related medication, these can also affect cognitive abilities including memory and learning capacity. However, research has shown that there are factors that can attenuate these age-related effects on older adults' learning experiences. Factors such as fostering personal interest and relevance in the topic, capitalising on rich life experience, good instructional design, and applying pedagogical skills can help overcome such barriers to learning and potentially motivate older adults to achieve successful learning outcomes (Bjorklund, 2011; Merriam & Bierema, 2014).

2.5.1.3.4 Section Summary

In summary, key education and adult learning principles, as well as pedagogical skills are relevant when providing older adults with education, including falls prevention education. Such relevancy lies in improving and retaining their knowledge and potentially overcoming age-related physiological changes. Accordingly, programs designed to provide falls prevention education for older adult learners should draw on these principles of design to improve effectiveness. The intent should be to provide education to better engage the older adult learner, raise the levels of awareness and knowledge, and motivation to promote eventual engagement and uptake of falls prevention strategies. These will be discussed further in the next section regarding evidence for providing falls prevention education. The present research will design a peer education program (intervention) that will incorporate these theories, skills and strategies. This program will be described in Chapter 7.

2.5.2 Studies evaluating the provision of patient-directed education for falls prevention

This section will provide a review of the literature that has examined the provision of falls prevention education for older adults, including the theoretical structure and concepts used to design the education interventions in these studies. Very few trials

have evaluated the provision of falls prevention education as a single intervention in community-based research. Hence, those trials conducted in hospital settings will also be included. Trials that have evaluated the provision of falls prevention education that specifically used a peer-led approach will be reviewed in Section 2.6.3.

2.5.2.1 Systematic review of the evidence for providing falls prevention education for older adults

The focus of this section is to examine the evidence from systematic reviews and meta-analyses or studies that have investigated falls prevention education as a single or part of a multifactorial intervention in two separate settings (hospital or community-based). A systematic search of the electronic databases was undertaken for relevant studies published from January 1995 to April 2016. Databases searched were CINAHL, Medline, and EMBASE. Key search terms included 'falls prevention' combined with 'education' initially, or variations dependent on the database searched. Systematic or literature reviews written in the English language and using these descriptors were also searched. The search strategy is presented in Appendix D, Table D.1. Figure 2.2 illustrates the studies/papers reviewed at each step of the review. Studies were included if they met all the following criteria:

- They investigated training and educating older adults regarding falls and falls prevention as a single strategy intervention or part of a multifactorial intervention
- Participants were older adults who were aged 60 years and over

Studies were excluded if any of the following criteria applied:

- They were investigating training and education regarding falls prevention for older adults who lived in residential-based care
- They investigated staff education regarding falls prevention
- They investigated non-education interventions
- They were not written in English

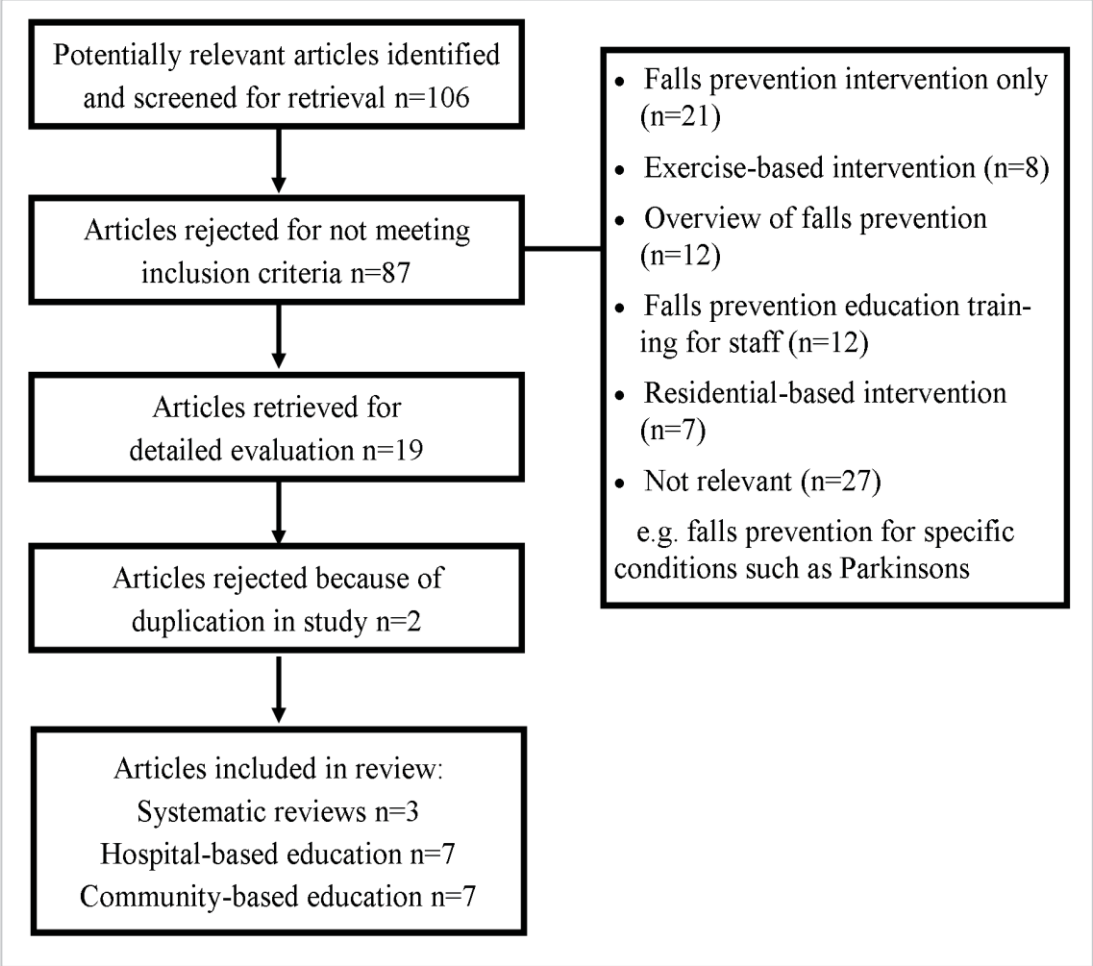

Figure 2.2 Flowchart of the Search and Selection for Articles Included in the Review of Providing Falls Prevention Education for Older Adults

The search strategy yielded 106 papers that were screened for eligibility in terms of inclusion criteria. On that basis, 87 papers were rejected and 19 were retrieved for evaluation. Two papers were found to be a duplication of the same study, thus reducing the number of eligible studies to 17.

Of the 17 studies, seven were conducted in hospital-settings and seven in the community. Three were systematic reviews that included falls prevention education in their evaluation (Chang et al., 2004; Gillespie et al., 2012; Lee, Pritchard, McDermott,& Haines, 2014). The systematic reviews will be discussed in Section 2.5.2.2; the community-based studies identified from the systematic reviews will be discussed in Section 2.5.2.3; and the hospital studies in Section 2.5.2.4. A full description of the community-based studies' characteristics is presented in Appendix D, Table D.2.

2.5.2.2 Systematic reviews examining the effect of providing education on falls

One of the key challenges in the field of falls prevention education research is that there is scarce evidence about design and delivery of relevant educational interventions. Only a small number of systematic reviews have examined the effect of providing education on falls outcomes. In comparison, when reviewing the research evidence in the field of cancer and diabetes education, these areas of health have more extensively investigated the potential benefits of providing health education. For example, systematic reviews into the effectiveness of a pre-operation education program for cancer patients (Waller et al., 2015) and cancer-related fatigue (Du et al., 2015) were examined. Fourteen studies were identified for the former review and 10 studies for the latter. These systematic reviews differentiated their findings according to the mode of delivery (face-to-face or group basis); strategies used (written or audio-visual) and education-related outcomes (knowledge, satisfaction or anxiety). Furthermore, these authors also provided evidence for the use of a theoretical framework and identified gaps for future research in their conclusion. Similarly, systematic reviews into the effectiveness of education in self-management of diabetes (Thongsai & Youjaiyen, 2013) and diabetic foot ulcer care (Dorresteijn, Kriegsman, Assendelft, & Valk, 2014) differentiated their findings according to different healthcare settings (community or residential care facilities). Evidence was then presented in detail regarding their interventions' content, dosage and whether primary or secondary outcomes were achieved.

However, regarding falls research, after database search and extraction, a systematic review and meta-analyses (Chang et al., 2004) found 40 falls prevention studies in older adults, but only two evaluated an education intervention as a primary component of the studies. Chang et al. (2004) did not specifically differentiate the studies' findings regarding the studies' mode of delivery, education strategies used, assessment tools, outcomes, nor elucidate the reader about the key issues in the education component of their review. Similarly, the second, more recent systematic review of 159 studies (79,193 participants) (Gillespie et al., 2012) evaluating the evidence for falls prevention interventions amongst community-dwelling older adults combined only four studies in the sub-group analyses which evaluated education (2,555 participants) (Dapp et al., 2011; Huang et al., 2010; Robson, Edwards,

Gallagher, & Baker, 2003; Ryan & Spellbring, 1996). This is in comparison with their sub-group analyses of exercise interventions where pooled data from of 59 studies (13,265 participants) (Gillespie et al., 2012). The community-based studies identified in the review will be discussed in the following section about falls prevention education in community settings.

The third systematic review specifically investigated the effectiveness of falls prevention education for older adults during their hospital stay or after their discharge (Lee et al., 2014). Nineteen studies were identified for meta-analyses and eleven studies were included for qualitative synthesis and critical narrative analysis (Lee et al., 2014). Their review found patient education in falls prevention to be effective in reducing the rate of falls [risk ratio 0.77, 95%CI (0.69 to 0.87)] and the number of fallers in hospital [risk ratio 0.78, 95%CI (0.7 to 0.87)] (Lee et al., 2014). This review is of better quality when compared to the earlier two systematic reviews in falls prevention education because the authors acknowledged the heterogeneity of the interventions in their findings and this was reflected in their analysis and reporting. The meta-analyses conducted were based on intervention factors such as healthcare setting, mode of delivery, educational strategy used and content/dosage of intervention. Consistent with other findings in the earlier section, the authors of this review (Lee et al., 2014) reported that only a few studies used theoretical models to guide their education interventions. One recommendation included using video-based multimedia in delivering falls prevention messages. Unfortunately, most of the studies in this review were hospital-based and it was not reported which education components of the post-discharge studies were delivered in hospital and which were delivered after discharge.

2.5.2.3 Summary of studies that investigated falls prevention education in community settings

Studies that evaluated the provision of falls prevention education in a community setting are summarised in Table 2.7. A detailed presentation of the characteristics of these studies is found in Appendix D, Table D.2. Community-based studies identified in the systematic review conducted by the candidate (detailed in Table 2.7) mainly delivered education as a provision of written brochures containing falls prevention information (Lin, Wolf, Hwang, Gong, & Chen, 2007; Rucker et al.,

2006), health information such as nutrition (Kim, Yoshida, & Suzuki, 2013) or exercise information (Chang et al., 2011), as a potential means of reducing falls. The content of the information was not specifically related to falls in some of these studies and appeared to use a generic non-tailored approach in the education component of their interventions. As highlighted earlier in Section 2.5.1.3.2 (Strategies for teaching adults) and reported by educational research studies, the use of written education brochure material alone and/or with minimal verbal interaction has been found to be insufficient and of less benefit in preventing falls compared to a multimedia and intensive feedback education approach (Haines et al., 2011; Tzeng & Yin, 2009). The use of multimedia is superior to written information in that it appeals to various learning styles (Dale, 1970; Merriam & Bierema, 2014). Compared to a generic approach as used in these studies, researchers have previously proposed that education interventions be underpinned by theories and be tailored to a group or the individual to be more effective in improving motivation and facilitating behaviour change (Brawley, Rejeski, & King, 2003; Kreuter, Oswald, Bull, & Clark, 2000; Kreuter & Wray, 2003; World Health Organisation, 2007; Yap & Davis, 2008). Finally, these studies did not provide information about the dosage of their education component nor elaborate on the content and design of the education material which is integral to measuring outcomes robustly and for reporting of the intervention such that it can be replicated.

Another study evaluated a 15-week exercise and education program conducted in the community by health professionals on either a group or home-basis (Haas & Haines, 2014; Haas, Mason, & Haines, 2014). In evaluating the program, the researchers found that very few of the older adults could recall the falls prevention education component of the program and concluded that the didactic approach used was insufficient for engaging participants. Unsurprisingly, it was found that only a few older adults adopted the recommendations offered. As discussed (Section 2.5.1.3.1 Adult learning), adult learners have a readiness to learn when they see relevance, are goal-oriented and like to draw on their prior experience to facilitate their learning (Knowles & Associates, 1984; Merriam & Bierema, 2014). These researchers recommended an alternative pedagogical approach such as using a goal-setting technique to increase knowledge and to influence behaviour change (Haas & Haines, 2014). In contrast, another randomised trial community-based falls prevention education study that also

included a home visit and teaching exercises to the older adult participants reduced falls significantly by 31% in their intervention group participants (Clemson et al., 2004). Their positive outcome was achieved by using a cognitive-behavioural approach, strategies to enhance adult learning including group interaction, practice, and encouraging participants to make an action plan.

Further community-based studies were identified (Dapp et al., 2011; Huang et al., 2010; Ryan & Spellbring, 1996) from the large systematic review (Gillespie et al., 2012). These studies found falls prevention education intervention not to be significantly effective in reducing falls-related outcomes. None of the four studies explicitly referred to adult learning principles or used educational theories, and two of them (Huang et al., 2010; Ryan & Spellbring, 1996) did not state any theoretical framework in guiding their education intervention component. As discussed in Section 2.5.1.1 (Health education), a theoretical framework is important in facilitating behaviour change and adult learning. One study's falls prevention education program was framed around the negative consequences of falling and did not foster personal relevance (Ryan & Spellbring, 1996).

In comparison, those community-based post-discharge studies (Hill, Hoffman, Beer, et al., 2011; Hill et al., 2013) identified in the systematic review (Lee et al., 2014) that were designed with theoretical models and conducted with multimedia and/or workbooks, with tailored one-on-one interaction with a health professional, had a positive impact on the community-dwelling participants. One of these studies was a pilot trial's education intervention design that was tested for pedagogical efficacy in meeting falls-related education and health behaviour outcomes prior to the conduct of the study (Hill et al., 2009). A related study by the same researcher (Hill et al., 2013) found that the group receiving intervention education increased their level of knowledge regarding falls prevention strategies (71%) when compared with the control group (29%). Another study, a pilot randomised trial of tailored multimedia falls prevention education using adult learning principles and guided by a theoretical framework, was found to be effective in significantly raising the patients' level of knowledge, motivation, self-confidence and self-perceived risk of falls as well as other health outcomes measures after discharge from hospital (Hill et al., 2013).

Table 2.7 Studies Providing Falls Prevention Education for Older Adults in the Community

Studies	Educational Intervention	Theoretical Framework Used	Comments
Ryan 1996[A]	*Content: Standardised falls prevention education program Emphasised threat of falling. Activities to address intrinsic and extrinsic risks. Cost-effectiveness by demonstration of device. Delivery: Face-to-face or group discussion	✗	Inconclusive findings of pilot study due to small sample size reported. Falls prevention messages were standardised; negative (threat-based), and were not personally relevant. None of the participants sought medical intervention for falls-related injuries
Clemson 2004	*Content: Falls-related knowledge and preventive strategies. Delivery: Cognitive-behavioural approach. Adult learning principles e.g. group interaction; practice	✓	Design and implementation of education intervention such as content and dosage were explicitly stated. Used validated outcome measures. Intervention group showed significant reduction falls compared to the control group
Rucker 2006	*Content: Falls printed educational material (reduce falls environmental hazards & optimise health e.g. medication review). Delivery: Telephone call (advice)	✗	Generic standardised information following evidence-based falls prevention guidelines. No significant difference between intervention and control group (fear of falls and recurrent falls)
Lin 2007	Content: Home education- pamphlet (exercises, use of walking aids, environmental improvements); Home Safety assessment and modification; Home exercise Delivery: Home visit	✗	Generic standardised falls prevention information provided in education. No significant difference in falls rates between the three groups
Huang 2010[A]	*Content: Tai Chi, Education (medication, nutrition and maintaining a safe environment)-brochure. Education and Tai Chi. Delivery: Discussion with videos of topics and photos	✗	Significant difference between three intervention groups (Ed, Tai Chi and Ed and Tai Chi) in reduction in falls rates compared to the control group
Chang 2011	Content: Exercise education program. Delivery: Telephone monitoring and Self-management	✗	Generic standardised information following evidence-based exercise and falls prevention guidelines. Significant difference in falls risk between intervention group compared to control group

Studies	Educational Intervention	Theoretical Framework Used	Comments
Dapp 2011[A]	*Content: Health education (health maintenance, cardiovascular risk prevention, cancer screening, vaccinations). Delivery: Health Appraisal Approach by doctor, medical team directed goal-setting, group sessions or home visits	✓	Individualised checklists but based on medical team-directed goal-setting for each individual; tailored recommendations and feedback; content was mainly health related and not specifically falls-related. Dosage was not stated. Significant increase in preventive care use index (e.g. uptake of vaccination, blood pressure check) and health behaviour index (proportion of favourable health behaviours)
Hill. 2011a[B]	*Content: Multimedia education package comprising empowering participants to reduce their falls risk. Delivery: Health Belief Model. Individualised tailored education from health professional	✓	A total of 629 falls prevention strategies were identified by participants. Of this, the 2 intervention groups identified 71% (445) of the falls prevention strategies compared to control group that identified only 29% (184) strategies
Hill 2013[B]	*Content: Raise awareness, knowledge about falls and falls prevention, motivational content. Delivery: Health Belief Model & Adult learning principles. Written and video materials & individualised tailored education by trained health professional prior to discharge, action plan developed	✓	Intervention group significantly more knowledgeable, confident and motivated than control. Significant increased self-perceived risk of falls, perceived falls injuries and likelihood return to functional activity
Kim 2013	Content: Strength and balance exercises vs education (nutrition, cognitive function, oral hygiene) Delivery: Exercise class	✗	No significant differences between exercise and education groups in repeated and injurious falls
Haas 2014	Content: Exercise skills training and education program (falls risk, behavioural changes, consequences of action or inaction). Delivery: Information-Motivation-Behavioural Skills model with goal-setting strategy (face to face individual) to increase motivation and self-efficacy	✓	Didactic approach used in education. Reported poor recall of education component by participants and poor uptake of recommendations. Recommended goal-setting technique

Note. ADL=Activities of Daily Living; Ed= education
[a]Hill, Hoffman, Beer, et al (2011)
[A] Studies that were part of the systematic review by Gillespie et al. (2012)
[B] Studies that were part of the systematic review by Lee et al. (2014)
*Intervention was compared against a control group

2.5.2.4 Provision of falls prevention education as an intervention for reducing falls in hospitals

A limited number of RCTs have been conducted in hospital settings that have included patient education (Ang, Mordiffi, & Wong, 2011; Cumming et al., 2008; Dykes et al., 2010; Haines et al., 2006; Healey, Monro, Cockram, Adams, & Heseltine, 2004). The following RCTs have evaluated patient education in falls prevention either by completing a primary or subgroup analysis in hospital populations (Table 2.8). These falls prevention education programs were delivered either as a single intervention (Haines et al., 2011; Hill et al., 2009; Hill et al., 2015) or as part of a multiple intervention (Ang et al., 2011; Dykes et al., 2010; Haines et al., 2006). Four of the studies in Table 2.8 used theoretically-driven models in their interventions and were found to be effective either when measured using falls-related outcome or improving participants' awareness of falls risk, knowledge about falls prevention or engagement in falls prevention strategies.

The study conducted by A-M. Hill et al. (2015) showed several significant positive effects. This cluster RCT could measure and demonstrate that the use of theoretical and adult learning principles led to participants taking appropriate falls prevention actions in hospital. A large RCT (n=1206) providing tailored multimedia falls prevention education designed using the Health Belief Model and behaviour change concepts, reduced falls in the intervention group by 49% (4.01 per 1,000 patient-days)(adjusted hazard ratio 0.51; 95% confidence interval 0.28-0.93) compared to the control group (8.72 per 1,000 patient-days) (adjusted hazard ratio 0.43; 95% confidence interval 0.24-0.78) in a cognitively intact older adult patient group whilst in the hospital (Haines et al., 2011). The cognitive status of these participants was screened using the Short Portable Mental Status Questionnaire where scores of 7 of 10 and above were considered to indicate that participants were cognitively intact. However, this study, which used a three group randomisation, demonstrated that using multimedia education (DVD and a written workbook) to provide falls prevention information showed no significant effect on falls outcomes (Haines et al., 2011). Only the group that received tailored follow-up to assist them to personalise the information and make an action plan had reduced falls incidence.

Table 2.8 Theories and Principles Applied in the Design of Hospital-Based Falls Prevention Education Trials and Effectiveness of Their Outcome Measures

Studies	Theories or principles applied	Intervention	Effectiveness (outcome measures)
Haines 2006	Threat appraisal; Protection Motivation Theory; Goal-setting and review	One-on-one education sessions with an occupational therapist and information booklet	Significantly lower fall incidence in intervention group patients. Increased awareness of falls risks
Hill. 2009	Health Belief Model	Education program either with DVD or a workbook	Intervention group patients showed significant increase in knowledge. Those with DVD education had higher perceived risk of falling, higher self-efficacy and motivation
Dykes 2010	No theory used	Tailored education using health information technology program and Falls Prevention Tool Kit software	Significant lower rate of falls in intervention group patients
Ang 2011	Education principles to increase awareness of risk of falling and knowledge of falls prevention strategies	Tailored education program	Decrease in fall incidence rates in intervention group patients
Haines 2011	Health Belief Model	Education program either with multimedia with health professional or written material only	Intervention with multimedia and health professional education reduced falls in patient subgroup (cognitive intact)
Hill 2015	Health Belief Model and adult learning principles	Multimedia education package with health professional follow-up	Intervention group patients had significant reduction in falls, injurious falls and fallers

Importantly, this study's findings underscore the BCT involving participants developing an action plan to personalise the information and message in the design of their education program. Overall, these findings support the work of Dale (1970) and Fleming & Baume (2006) introduced earlier in Section 2.5.1.3.2 (Strategies for teaching adults) regarding multimedia-based education to accommodate the different learning styles.

However, these research trials listed earlier in Table 2.8 were conducted in a hospital setting. Although they demonstrated the benefits of using theory to design

and deliver their interventions, the interventions were individually tailored and presented using an intensive face-to-face mode of delivery by trained health professionals. Therefore, the findings from these trials may not be as applicable for falls prevention education which is provided to older adult groups in a community setting. However, the findings from those hospital-based falls prevention education studies do demonstrate that the use of theory could be extended to the design of community-based falls prevention education studies.

2.5.2.5 Challenges in providing falls prevention education

Overall, there is a paucity of studies investigating educational interventions for older adults in falls prevention. Besides the scarcity of evidence about the efficacy of educational interventions, there appears to be a problem with the methodology of trials conducted in this field of research. Apart from some exceptions, mainly in the hospital-based studies, most of the other studies have not been designed with an explicit theoretical, educational or pedagogical framework in mind, or with health behaviour change concepts being clearly articulated. As discussed in the earlier section, research has found that some older adults have been found to possess low levels of knowledge and motivation and feel that falls prevention is not personally relevant. Barriers to engaging in falls prevention strategies were also identified. Accordingly, an intervention should be designed using theoretical models, encompass adult learning pedagogical principles and behaviour change concepts to optimise adult learning, improve knowledge, and enhance motivation, to provide maximum likelihood of achieving an engagement with the target health behaviour topic. The challenge remains to determine whether falls prevention education is a viable means of reducing falls by providing more compelling evidence through well-designed and rigorous investigations.

2.6 Providing Peer Education for Falls Prevention

Peer education has been used as a health education approach for providing older adults with falls prevention education. This section will critically review the evidence for the efficacy of peer education programs in the area of health, emphasising evidence for programs pertaining to older adults. This section will include a systematic review of studies that have used peer approaches for delivering falls prevention education.

2.6.1 Definition of peer and peer education

Articulating a clear definition of a peer facilitates an understanding of the peer role and assists in objectively evaluating peer-led education interventions. Peers have been described as groups that share common characteristics, circumstances, and experiences (i.e. 'peerness') instead of just being characterised as possessing a single characteristic (Shiner, 1999; Simoni et al., 2011). However, other researchers have found that the description of who constitutes a *peer* has not been addressed well in the research literature (Doull, O'Connor, Welch, Tugwel, & Wells, 2008), and some have stated that there is no consensus of who a peer is in the literature (Shiner, 1999; Simoni et al., 2011). This is supported by numerous studies (Dale, Caramlau, Lindenmeyer, & Williams, 2008; Dennis, 2003; Dorgo, Robinson, & Bader, 2009; Doull et al., 2008; Garcia, Metha, Perfect, & McWhirter, 1997; Lobo, McManus, Brown, Hildebrand, & Maycock, 2010; Lorig, Hurwicz, Sobel, Hobbs, & Ritter, 2005; Simoni et al., 2011; Solomon, Secker-Walker, Flynn, Skelly, & Capeless, 2000; South, Meah, Bagnall, & Jones, 2013; Turner & Shepherd, 1999; Webel, Okonsky, Trompeta, & Holzemer, 2010) which have shown that there is considerable variation in approaches, roles, modalities and settings of peer interventions, as shown in Table 2.9.

Table 2.9 Definitions of the Characteristics of Peers and Peer-Led Interventions in the Literature

Characteristics	Descriptors
Terminology	Volunteer walk leader; community health educator; lay volunteer worker; peer leader; peer mentor
Approach	One-to-one (individual), one-to-group basis or combination
Roles	Peer mentoring; peer support peer counselling; peer education
Focus	Providing emotional, appraisal or informational support
Modality	Face-to-face; telephone; online email; internet
Setting	Hospital; community; clubs
Age groups and Context	Youth mental health Older adult falls prevention Pregnant women and smoking
Experience or area of Interest	*HIV; cancer; smoking; physical activity for older adult; chronic disease

*HIV: Human Immunodeficiency Virus

While a peer has been described as someone with shared characteristics (Shiner, 1999; Simoni et al., 2011), other studies and reports have defined a peer differently, including by traits such as someone whom the peers trust (United Nations, 2003) or as accepted by their peers (Australian Injecting & Illicit Drug Users League, 2006). Overall, research suggests that a peer may be defined by three elements (Simoni et al., 2011; South et al., 2013). Firstly, the peers share relevant common characteristics with the target group, such as age, even though some other characteristics may vary between the peer and the group, such as ethnicity, gender, socioeconomic status, culture, religion or education. The second element is that the peer experience is valued by the organiser of the peer education program and the peer-led role is an integral component of the intervention being tested. These characteristics enhance the capacity of peers to share, relate and empathise with their target groups in a way that non-peers were unable to do (Doull et al., 2008). The third element is that the peer educators are engaged as volunteers (i.e. have a non-formal role) and have not received formal vocational education for their role.

There is also no single definition regarding the term "peer education" in health. A comprehensive review of studies investigating peer education in the area of health, alcohol and drugs found variations in use of the term peer education, and reported that in most cases, the term was not clearly defined (McDonald, Roche, Durbridge, & Skinner, 2003). Peer education has been described as an "umbrella" term (Shiner, 1999, p. 557) used to describe a range of interventions and learning approaches, where both the educator and the peer(s) share an affinity with a characteristic such as age or experience. In healthcare, peer education has been described as a method to communicate health information, increase knowledge and awareness of a topic, impart values and facilitate behaviour change with their peers (Sciacca, 1987; South et al., 2013). In addition, it has been recommended that peer education should encompass skill-building and making informed decisions, which differentiates peer education from other peer interventions (USAID, 2010). Other researchers have stated that peer education may be differentiated from other peer interventions by examining the focus of the delivery (Shiner, 1999), with peer delivery seeking to empower the participants, providing skill development as well as achieving desired outcomes (Madden, 2005). This involves a process of training motivated volunteers to impart knowledge and share attitudes, beliefs and skills with their peers

(Stakic, Zielony, Bodiroza, & Kimzeke, 2003). Therefore, peer education in health can be viewed as a session or a series of sessions, delivered by a trained lay volunteer to impart health information and skills but also to influence the health-related behaviour of the audience.

2.6.2 Rationale, benefits and challenges of peer-led education in health

Studies reviewing peer-led health education conducted in younger populations have identified benefits for both the peer educators and for the organisation (Quine, 2006; Turner & Shepherd, 1999). Such benefits have provided a rationale for and justification of the peer education approach in healthcare (Table 2.10).

Table 2.10 Benefits, Justification and Rationale for Peer-Led Education in Health from Studies Involving Younger Populations

Psychosocial benefits	Organisational benefits
Empowering for peer educators	More cost-effective method
Beneficial for peer educators	More successful than professional-led education programs
Peer educators are positive and credible role models	More acceptable education option for some groups when other education is not
Reinforce learning through ongoing interaction	Ability to reach marginal social or cultural groups
Peer educators experience enhanced self-esteem	Uses an established means of sharing information

Socio-cognitive theories highlight the cognitive processes but also the influence of social support on an individual's behavioural intentions (Ajzen, 1985; Bandura, 1977a; Bandura, 1977b; Michie et al., 2011). Within these theoretical frameworks, trained peer educators have the potential to impart information and skills to enable older adults to weigh up the perceived costs and benefits of engaging in health behaviours, such as falls prevention activities.

Peer-led education has been used in a broad range of health areas to address a diverse range of conditions among differing populations. Peer-led education programs have been found to be effective in facilitating behaviour change among people living with chronic health conditions (Foster, Taylor, Eldridge, Ramsay, &

Griffiths, 2007; Lorig et al., 2005; Quinones et al., 2014), those with mental health problems (Cook et al., 2010), patients with various forms of cancer (Helgeson, Cohen, Schulz, & Yasko, 2001) and people with Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) (UNAIDS, 1999).

A systematic review of 25 randomised clinical trials (n = 8,942 participants) of peer-based interventions found moderate positive changes across seven health-related behaviour outcomes including increasing physical activity, reducing smoking and increasing condom use (Webel et al., 2010). The studies adopted either a one-to-one peer buddy, group-based peer, or a combination of peer approaches, and time spent delivering peer-based interventions ranged widely from 5.3 minutes to 150 minutes. The review highlighted that peer-based approaches were adaptable and could be applied to real-life situations. However, a limitation of the review methodology was that several studies were excluded because they did not contain direct measures of behaviour change such as dose of intervention (e.g. time spent), or instruments used to derive their outcomes were not reported (Webel et al., 2010). The authors concluded that the evidence regarding the efficacy of the peer-based interventions was mixed and suggested that a more rigorous methodology (e.g. quantification of dosage) be applied when designing and conducting future studies.

A systematic review (Foster et al., 2007) of 17 studies using lay leaders (peers) to educate and promote self-management of chronic conditions (including arthritis, diabetes, hypertension and chronic pain) demonstrated positive outcomes amongst 7,442 participants (aged 44 to 79 years). Fourteen of the studies were based on the self-efficacy theory, one study used theory of reasoned action, and another study used social support as its theoretical basis while the remaining study did not mention any theoretical framework. Modest short-term improvements were found in participants' self-efficacy, self-rated health, cognitive symptom management and frequency of exercise, but not in psychological health, quality of health and use of healthcare services. As discussed earlier in Section 2.5.1.1 (Health education), there is an increased likelihood of behaviour change when interventions are delivered using theoretical frameworks. However, the studies included in this review did not report whether they incorporated adult learning principles or educational aspects such as pedagogical skills and training, into the design or implementation of their programs.

There is limited appreciation that designing, developing, implementing and evaluating a peer education program is a complex process (Karwalajtys et al., 2009; Simoni et al., 2011). While there are benefits of peer education in health as described, there are also challenges in using such an approach. This is because educational interventions such as the intervention evaluated in this thesis is deemed complex. Educational interventions require rigorous design and evaluation at multiple stages to find out which active ingredient (behaviour change component) of the intervention (Michie et al., 2011) is responsible for the findings (Medical Research Council, 2000; Murray, 2002). Moreover, explicit role definition of peer educators in a program is important because this can affect its fidelity and training of peer educators (South et al., 2013). A study in peer education in community cardiovascular health awareness for older adults elaborated that when the peer educator's role and aims of the program were not explicit, a variation in understanding and consequently, variations in implementing the program can occur impacting on program fidelity (Karwalajtys et al., 2009). However, a systematic review of peer education studies (health promotion) has reported that the peer educator's primary role in forming the basis of the program design was limited or was not explicit in how the role differentiates from those of professionals (Simoni et al., 2011; South et al., 2013). In addition, there are challenges with recruitment, retention and training of peer educators (Peel & Warburton, 2009; Vernon, 2010). Issues regarding the uncertainty about the content of training and how the training of peer educators should be conducted including who trains the trainer were raised in a review of peer education in falls prevention (Peel & Warburton, 2009). Furthermore, there is also a challenge of retention and inherent attrition risk that is higher when the peer educators belong to the older adult cohort who can become unwell.

In summary, though there are challenges in using peer education, the theoretical rationale, and benefits of this approach provide a generalised justification for this type of education as a feasible intervention to promote health behaviour change (Milburn, 1995). However, these justifications have been mainly drawn from peer education studies involving younger people and most of the studies have yet to show conclusive evidence supporting the efficacy of peer education on health outcomes (Turner & Shepherd, 1999). Moreover, none of the empirical evidence in the systematic reviews applied to falls prevention and only few study designs were based

on behaviour change theory or education concepts. There have been limited studies that have evaluated the effect of using peer education for facilitating behaviour change in falls prevention. Nevertheless, peer education has consistently been described as a promising approach in influencing health behaviour and researchers have strongly advocated for further evaluation of its processes and efficacy (Milburn, 1995; Peel & Warburton, 2009; Simoni et al., 2011; Turner & Shepherd, 1999).

2.6.3 Peer education conducted for older adults in the area of falls prevention

There is limited empirical research that has evaluated the efficacy of peer education in falls prevention among community-dwelling older adults. A systematic review was conducted to examine the theoretical basis and justification for providing peer education for falls prevention education for community-dwelling older adults. The aim of the review was also to compare the differences in the interventions, their effectiveness and challenges faced in conducting research in this area.

2.6.3.1 Peer-led falls prevention education for community-dwelling older adults: A systematic review

A range of electronic databases was searched for relevant studies published between 01 January 1980 and 15 April 2016. These were CINAHL, Medline, EMBASE, Ovid Nursing and Ovid Journals. The search terms included MeSH terms and others in the electronic databases as well as others in the search for grey literature. The reference lists of articles found in the search were also checked for potential relevant studies or papers. The search strategy is presented in Table 2.11. Key words used were variations dependent on the database searched: health promotion/patient education/health education combined with peer/peer group and falls.

Table 2.11 Search Strategy Conducted in the Process of Systematic Review (Peer-Led Falls Prevention Education Studies)

Electronic database and search terms used
CINAHL search terms S1 (MM "Patient Education+") S2 (MM "Health Promotion") S3 (MM "Accidental Falls/ED/PC") S4 (MM "Peer Group") OR (MM "Peer Counseling") S5 peer* S6 (S1 or S2 or S3) and (S4 or S5) Limiters - Published Date: 19800101-20160415
Ovid Nursing search terms 1. exp health education/ 2. exp health promotion/ 3. exp accidental falls/ 4. peer*.mp. 5. (1 or 2 or 3) and 4
Medline and Embase search terms 1. exp *health education/ 2. exp *health promotion/ 3. exp *Accidental Falls/pc [Prevention & Control] 4. peer*.mp. 5. (1 or 2 or 3) and 4
Journals@Ovid and Medline In-Process & Other Non-Indexed Citations search terms 1. Peer*.ti 2. (educat* or fall* or promot* or prevent*).ti 3. 1 and 2
Other search terms used in non-scholarly websites for grey literature included: Lay; peer; accidental falls, elderly; older people; health education; health promotion
Search was limited to those studies available in the English language.

2.6.3.1.1 Inclusion and exclusion criteria

The inclusion and exclusion criteria for the studies in the review are presented in Table 2.12. Studies were included only if they used a one-to-group format for the intervention and a trained volunteer peer educator to impart falls prevention information.

Table 2.12 Inclusion and Exclusion Criteria of Studies in Systematic Review (Peer-Led Falls Prevention Education)

Inclusion criteria	Exclusion criteria
Types of studies	
RCT, non-RCT.	
Types of participants	
Older adults 60 years and over in age	Adults below the age of 60
Living independently in the community	Those older adults living in residential aged care facilities or requiring long-term health care and those hospitalised
Types of intervention	
Trained older adult volunteer (peer)	A one peer-to-one peer format intervention
Providing education to peers	Non-education intervention or fitness program
In a one peer-to-one group format	
Content is falls prevention	

2.6.3.1.2 Data extraction

Initially, article titles and abstracts were checked for relevancy according to the inclusion criteria. The articles were also checked for duplicates and if they involved the same study. The articles that passed the initial screening were retrieved for detailed evaluation for eligibility by two independent researchers. Subsequently, the methodological quality of the studies in those articles was evaluated in terms of the modified Downs and Black checklist (Downs & Black, 1998; Eng et al., 2007). This is a checklist to review methodological quality in randomised (RCT) and non-randomised controlled trials (non-RCT) studies. The checklist has been tested for validity and reliability (Downs & Black, 1998; Eng et al., 2007). It rates a study against the criteria of reporting (aims, outcome measures, participant profile, intervention, findings), external and internal validity (bias), internal validity (confounding) and presence of power or sample size calculation of the study, with a total possible Quality Index Score of 28. A higher score indicates a relative higher methodological quality but no acceptable score rating of the checklist has been advised (Eng et al., 2007).

2.6.3.1.3 Results

The search strategy yielded 70 papers that were screened for eligibility in terms of inclusion criteria. Sixty-one papers were rejected and nine papers were retrieved for evaluation. Five papers were found to involve the same study. Overall, only four papers (Allen, 2004; Deery et al., 2000; Kempton et al., 2000; Robson et al., 2003) were included in the review. Figure 2.3 illustrates the procedure at each stage of the screening and reviewing process. A summary of the included studies that evaluated the effect of providing peer education in the area of falls prevention health-related education is provided in Table 2.13.

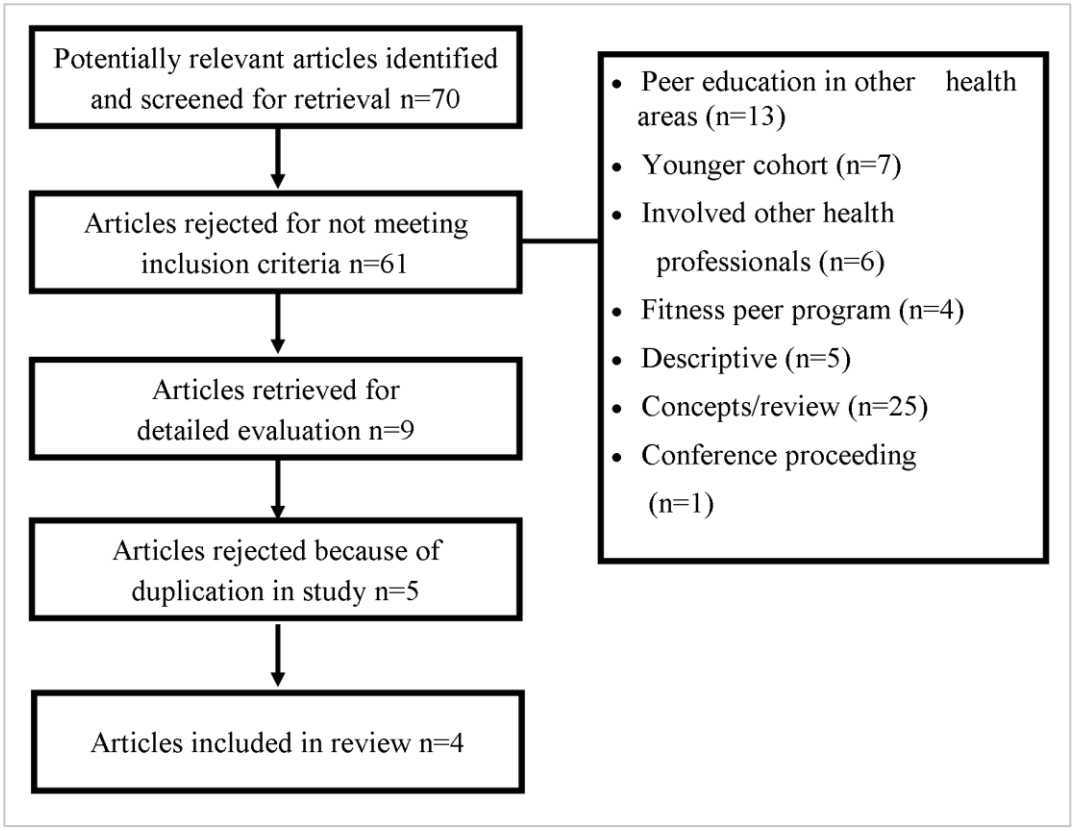

Figure 2.3 Flowchart of the Search and Selection of Articles Included in the Review of Peer-Led Falls Prevention Education Studies

Table 2.13 Evaluation and Rating of the Previous Peer-Led Falls Prevention Studies for Community-Dwelling Older Adults

First Author	Design	Sample Description (n)	Quality Index score	Program Description and Outcome measures	Results	Comments
Allen 2004	Quasi-experimental	Control Nil 521 (48% response) for initial questionnaire 50 for 2nd questionnaire	4/28	Positive Action on Falls" program in UK. One info session. 10 Peer Educators Baseline and follow-up questionnaire 6-8 months, focus groups after 2-4 weeks post-info. To raise awareness and assess own risk of falls and change behaviour as per Kirkpatrick model. 57 groups, totals 1,100 people	90% in focus group approved presentations in terms of providing falls education. Follow-up 26% made changes	Poor response in follow-up questionnaire Has defined term "peer" Used Kirkpatrick (1979) model
Deery 2000	Non-RCT	Control 142 Female: 76.7% Male: 23.3% Intervention 149 Female: 79.4% Male: 20.6%	14/28	Up & About" program in Victoria, Australia. 90 mins info sessions by Peer Presenters to groups of 15-20 people Outcome measures at baseline, three and 12 months' follow-up. Pre-post questionnaire to assess knowledge, attitudes and behaviour. Knowledge on falls prevention, risk factors and home modification	Intervention group took up more falls prevention action but no difference in falls outcome compared to Control group	Selection bias Home hazards only

First Author	Design	Sample Description (n)	Quality Index score	Program Description and Outcome measures	Results	Comments
Kempton 2000	One study intervention out of a series forming a larger study	Control 1131 (67.9%) Intervention 1314 (66%)	19/28	"Stay on Your Feet" program North Coast, NSW 1992-1995. Multifactorial, multi-strategic falls intervention program. Involved raising awareness via media, community education (peer) and policy development Formative, Process and Outcome evaluation. Pre-Post Telephone interview survey over an 18-month period. To assess falls-related knowledge, attitudes, risk factors and behaviour	Significant increase in knowledge that falls are preventable, risk of falls and awareness of footwear safety. 20% lower age standardised rate of fall-related hospital admission in Intervention group compared to Control group. Non-significant difference in rate of falls between 2 groups	No sub-group analysis of peer community educator involvement
Robson 2003	RCT	Control 236 Female 80.1% Male: 19.9% Intervention 235 Female: 82.1% Male 17.9% Average Age 75 years old Inclusion criteria: a) able to walk assisted for 20 minutes b) get up from and down to floor themselves c) no health problems that made it difficult for them to function	21/28	Steady As You Go" program in Canada. 2x 90 mins, one month apart. Health education and exercise Baseline pre and post telephone survey at 1 month and 4 months follow-up. To assess rate of falls, risk of falls and identify hazards in community	Intervention group significantly reduced in 8 out of 9 risk factors. (8 risk factors were: paying attention, taking risks, footwear, footcare, vision, hazards at home, balance and leg strength. Risk factor medication was not significantly reduced Rate of falls was lower in Intervention Group but not significant	Used Health Belief model and Social Learning Theory Training of senior facilitators not specified Manual and video provided to Intervention group participants

2.6.3.1.4 Quality of the studies

The studies examined were found to have moderate methodological issues. All the studies except one scored less than 70% when rated with the Downs and Black checklist. Only one study with a score of 75% (Robson et al., 2003) defined a fall in their study, specified inclusion criteria used and stated use of theoretical models in the design of the program and training of peer educators.

The strength of all four studies was that they evaluated the effects of the peer-led education by following up participants after the delivery of the intervention. The follow-up periods ranged from three or four months (Deery et al., 2000; Robson et al., 2003), six to eight months (Allen, 2004), and 12 months (Deery et al., 2000). However, the attrition rate affected the numbers assessed at the final follow-up. Loss to follow up was reported in two of the studies and varied, ranging from 90% (Allen, 2004) to 44% (Deery et al., 2000), while the attrition in the other studies was not reported. Three of the studies (Deery et al., 2000; Kempton et al., 2000; Robson et al., 2003) compared the effect of the intervention with a control group that strengthened confidence in the findings about the efficacy of their intervention. Table 2.14 presents the strengths and limitations of these studies in summary form.

The included studies evaluated the effectiveness of their outcomes by conducting a process evaluation of the program with their stakeholders. However, these evaluations were reported anecdotally (Allen, 2004; Robson et al., 2003). They sought qualitative feedback from participants about how well the presentations delivered the message and found a high level of consensus (90%) amongst participants (Allen, 2004). The researchers also found the self-reporting of more social contact, enjoyment, and positive feeling of the program (Robson et al., 2003). These findings indicated that the program had a positive impact, which would therefore facilitate engagement with the messages delivered. However, the studies did not explicitly measure outcomes of falls-related knowledge, skills and behaviour change.

Table 2.14 Overview of Previous Peer-Led Falls Prevention Studies for Community-Dwelling Older Adults

First author	Definition of peer	Design uses Theoretical Framework	Behaviour change assessed	Peer educator training program provided	Intervention described	Control group	Follow-up
Allen 2004	✓	✓	✗	✓	✗	✗	✓
Deery 2000	✗	✗	✗	✗	✓	✓	✓
Kempton 2000	✗	✗	✗	✗	✗	✓	✓
Robson 2003	✗	✓	✗	✓	✓	✓	✓

Note: In all studies, there was no assessment of intervention fidelity.

One study demonstrated that the older adults who received the peer education program (intervention group) maintained a significantly greater knowledge of strategies that prevent falls at 12-month follow-up (Deery et al., 2000). The intervention group also took more action to prevent falls when followed up at three months and 12 months (Deery et al., 2000). In another study, which also delivered a peer education program, the intervention group reduced their risk of a fall after receiving the program as measured by a falls risk screening tool (Robson et al., 2003). The falls risk tool included items which measured home hazards; vision modification or improvement; and more appropriate safer footwear (Robson et al., 2003). However, these improvements were not statistically significant when compared to the change in the control groups. Reported reasons for the lack of effect of the intervention included the short follow-up period (Robson et al., 2003); low power of the study (Deery et al., 2000); differences in baseline between intervention and control groups (Deery et al., 2000); use of self-report; and poor recall during data collection (Deery et al., 2000). It was thus suggested that peer education in falls prevention may be ineffective (Deery et al., 2000). However, none of the studies explored other methodological and theoretical issues that may have influenced how the education worked to affect and impact on the falls-related outcomes. As highlighted earlier, some barriers to uptake of falls prevention strategies previously identified have included that older adults may have low levels of knowledge and motivation in this area. Moreover, researchers in adult learning and behaviour change have recommended that any learning in education

should scaffold learners' knowledge but also cultivate learners' motivation and foster their self-efficacy (Merriam & Bierema, 2014; Wlodkowski, 2008). There should also be consideration regarding the effect of ageing on learning. However, it is not clear if the interventions evaluated in these peer-led studies incorporated such factors to address the older adults' knowledge and motivation to achieve the desired health behaviour change.

All the studies in the review reported limited use of behaviour change or education theory(s) to guide the steps from design, implementation and finally evaluation of the program. As previously discussed, a theory-driven intervention has been advocated because use of a framework provides cumulative knowledge to aid in developing and evaluating interventions (Noar & Zimmerman, 2005). Behavioural interventions should provide a description of the content and dosage of their delivery and most importantly, the active component(s) of their interventions intended to facilitate behaviour change (Michie & Johnson, 2012).

In the studies reviewed, there was also limited information reported about the validity and reliability of the questionnaires used to evaluate program outcome measures. It was not stated if the questionnaires used for evaluation in all the studies were psychometrically validated, reliable or pilot-tested. In addition, only two studies (Deery et al., 2000; Robson et al., 2003) described the duration and content of their intervention such as timing of presentation and resources provided to their participants (Michie & Johnson, 2012).

There were elements of inconsistencies in one study (Allen, 2004) between the aims of the study (peer educators being provider of information and change agent); and their reported results (percentage of older adults who report their falls to health professionals). That is, the results did not reflect the aims stated at the start of the study. There appeared to be an emphasis on an environmental home hazards approach of falls prevention education rather than including other evidence-based strategies such as exercise or vision improvement (Allen, 2004; Deery et al., 2000; Kempton et al., 2000). As mentioned in Section 2.3.2.1, there is strong evidence for engaging exercises in minimising the risk of falls.

There was no report of the peer-led studies' intervention or program fidelity. It could be that these interventions did not facilitate behaviour change in the intended manner of their delivery (program fidelity). Fidelity is the use of methodological strategies to monitor and to maximise the extent in which the treatment (intervention) was "implemented as intended" (Moncher & Prinz, 1991, p. 247). Fidelity enhances the reliability and validity of behavioural interventions (Borrelli et al., 2005). This can involve checklists and/or feedback processes such as monitoring and feedback of peer educators' presentations to determine whether the intervention was delivered as planned, with potential impact on outcomes. Program fidelity conducted as part of this research will be elaborated further on in Chapter 7, Section 7.8.1.

These limitations in the design and evaluation of falls prevention peer education programs limit the evaluation, interpretation, and potential generalisability of their findings (De Vaus, 2014; Portney & Watkins, 2009). It also limits potential replication of the program for further evaluation.

2.6.3.2 Limitations of the current research

This section will discuss the limitations of the peer-led falls prevention studies in the previous section, in the context of health behaviour change, adult learning principles and concepts related to peer education including definition of their peer and peer-led education used, as highlighted in Section 2.6.1 (Definition of peer and peer education).

At the pre-conceptualisation stage, it was not clear whether peer education was a method of delivery that the community-dwelling older adults (target audience) preferred for receiving falls prevention education. The studies reported that the peer programs were initiated based on theoretical rationale and perceived benefits of peer education. However, the researchers did not state if they explored whether this approach was preferred by their target audience. As discussed previously in Section 2.4, there exists a less than optimal level of engagement of older adults in falls prevention (Nyman & Victor, 2012) partly because there are perceived barriers towards engagement and uptake of the falls prevention strategies. Peer education can be an invaluable approach because peer educators can be role models and a social influence to enhance engagement in falls prevention (Peel & Warburton, 2009). Had

the researchers involved older adults at the design stage of the research, the content and design could be explored from the perspective of the target recipients or consumers (older adults) themselves. Accordingly, the peer education program could be optimally designed to enhance the relevance of the program content and feasibility of the peer-led approach.

At the design stage, three of the studies did not provide a description or definition of a peer educator, how they recruited their peer educators, or the design of the training program for peer educators (e.g. duration and content). Only one study (Allen, 2004) provided a definition of a peer. As mentioned in the earlier Section 2.6.1, researchers have recommended that peer be defined by degree of peer influence (Simoni et al., 2011). As highlighted in previous sections, behaviour change theory should be used to provide an evidence-based coherent body of knowledge and the steps for the design and implementation of behaviour change interventions (Craig, Dieppe et al., 2013; Craig et al., 2008; Improved Clinical Effectiveness through Behavioural Research Group (ICEBeRG), 2006). Only one study (Robson et al., 2003) mentioned the use of theoretical conceptualisation and a framework that informed the design of their primary intervention, but explanatory detail was not reported. Importantly, details about the choice of theory, as well as how the theory was integrated into the instructional design, for their peer educators to deliver the content, were not provided.

In a comprehensive literature review, Peel and Warburton (2009) concluded that certain aspects of the peer-led approach could be a viable means of delivering falls prevention information to older adults to increase their awareness of the risk associated with falling, and improve their knowledge of falls prevention strategies on the basis of behaviour change theories and findings of previous studies (discussed in Section 2.5.1.2 Behaviour change theories; Section 2.6.2 Rationale and benefits of peer-led education in health). A peer educator may be a positive role model; an individual promoting empowerment; an opinion leader encouraging social acceptance and one possessing the capacity to influence opinions of the target group (Peel & Warburton, 2009). It was also suggested that peer educators could promote self-efficacy and be agents for health behaviour change (Peel & Warburton, 2009). Therefore, a peer-led approach could capitalise on these promising considerations to influence older adults in falls prevention. One of the peer-led studies (Kempton et al., 2000; Vernon, 2010)

described training their peer educators in areas of public speaking and falls prevention content but there was no further information or justification for the approach taken. Allen (2004) mentioned the use of the Kirkpatrick model (Kirkpatrick, 1979) for training purposes and for evaluation of the program, but no details about how the model was incorporated into the study were provided. None of the studies reported design features that facilitated tailoring the education to the older adult participants' different falls prevention needs or learning styles. There was also limited reporting about what strategies peer educators utilised to promote and tailor education and engagement with the falls prevention message; enhance adult learning; or foster behaviour change to achieve stipulated outcomes in the peer-led studies. As mentioned in Section 2.5.1.3, instructional design for adult learners should integrate the principles of adult learning (Knowles & Associates, 1984; Merriam & Bierema, 2014), including fostering personal relevance and capitalising on the older adults' rich experience, as well as addressing their motivation (Wlodkowski, 2008) and appealing to their different learning styles (Fleming & Baume, 2006) in presentations. Additionally, the studies investigated did not report on how their peer educators' credibility or social influences were established amongst the peer recipients of the education.

The peer studies reviewed suggested as part of their evaluation, that the peer educator could be an empowering role model (Allen, 2004; Garner et al., 1996; Kempton et al., 2000) or engender strong rapport (Deery et al., 2000) with participants. Indeed, positive social influences and learning experience can facilitate engagement of older adults in falls prevention, as highlighted by the qualitative research evidence in the Section 2.4.1 (Bunn et al., 2008; Dickinson, Machen, et al., 2011; Dollard, Barton, Newbury, & Turnbull, 2013). Peer educators' life experience amongst contemporaries who share similar experiences was mentioned as a study strength (Allen, 2004), but limited data was provided to support this insight. There was also limited evaluation obtained by seeking the peer educators' feedback about their experience of delivering the program. In conclusion, little is known about what behaviour change component was used (sometimes described as the "active ingredient") (Michie et al., 2011) or how the delivery contributed to the observed outcomes and there is scant information about the interventions or program fidelity and the challenges faced by peer educators.

In summary, extensive investigation has shown peer education to be an effective approach to improve knowledge and motivation and facilitate positive behaviour change in other areas of health such as cancer, diabetes and other chronic conditions. Hence, this approach could also be a viable means of providing falls prevention education. While there is strong evidence for achieving theory-driven interventions behavioural outcomes such as improving knowledge and motivation, studies conducted in falls prevention have not, in the main, used theories nor behaviour change concepts in the design, development and evaluation of their interventions. There is also strong evidence from the field of education that it is important to utilise adult learning principles and proven pedagogical skills to effectively engage older adults in learning. Currently, there is uncertainty about whether peer education is a viable approach, either alone or as part of other falls prevention programs, for providing older adults with falls prevention education. It is, therefore, important that rigorous methodology be used to design future studies to evaluate the impact of a peer-led falls prevention education program. These will be described in Chapter 7 and Chapter 8.

2.7 Summary of Research Gap

Falls prevalence among older adults is a significant physical, psychosocial and economic problem. While there is good evidence about the risk factors that contribute to falling, and established, effective evidence-based strategies to minimise these risks, there has been limited translation of this evidence for falls prevention strategies into practice. This gap between the research evidence and translation of this evidence into practice exists, partly because there is limited uptake and adherence to these strategies by older adults themselves. Barriers to uptake are in part due to some older adults' low levels of awareness about falls risk, knowledge about falls and motivation to take up falls prevention strategies.

Health education could be a means to bridge this gap by raising older adults' knowledge and motivation about falls and falls prevention. However, health education design and implementation should be underpinned by theoretical framework(s), health behaviour change concepts, adult learning principles, and pedagogical considerations to facilitate engagement with the messages provided and potential uptake of strategies

recommended. However, health education studies in falls prevention have not consistently applied these considerations. More rigorous research trials are needed.

Peer education, a form of health education, is a potential valuable approach to raise the awareness, knowledge and motivation of older adults regarding falls prevention. Other community-based health-related peer education studies have shown that this approach can be effective. However, there is a dearth of studies that have investigated peer-led falls prevention education, in particular the one-peer-to-group presentation format. Besides the scarcity of studies, previous studies' education interventions have largely not been designed or implemented with conceptual considerations as suggested, nor evaluated in terms of fidelity as well as effectiveness in facilitating behaviour change. Understanding and evaluating the effectiveness of an education intervention in bridging the gap in knowledge and facilitating behaviour change should be a precursor to assessing falls-related outcomes.

Therefore, the purpose of this research is to provide a peer-led falls prevention education program designed with these underlying conceptual considerations in mind and to determine its impact on community-dwelling older adults' beliefs, knowledge, motivation and intention to engage in falls prevention strategies. Lessons gleaned and challenges faced from this research will further improve our understanding of how peer-led falls prevention education should be delivered. The findings can be used to promote initiatives to enhance the engagement of community-dwelling older adults in this area and encourage uptake of falls prevention strategies. These initiatives have the potential to reduce the personal, physical, psychosocial burden and economic costs of falls and falls-related injuries in this population.

2.8 Research Aims

The primary aim of this research was to design a peer-led falls prevention education program and evaluate its impact on community-dwelling older adults' beliefs, knowledge, motivation, and intention to engage in falls prevention strategies. The peer educators were older adult volunteers who shared an affinity with the age group of their audience. These peer educators were trained to provide falls prevention education as well as impart skills and foster motivation among other older adults in a community group setting.

The secondary aims of the research were to:

1. Explore the perspectives of a group of peer educators about their role in delivering peer-led falls prevention education for community-dwelling older adults
2. Examine the views and preferences of community-dwelling older adults about seeking and receiving falls prevention information
3. Evaluate peer educators' presentations of falls prevention education for community-dwelling older adults against established criteria that were consistent with adult learning principles, the framework of health behaviour change, falls prevention guidelines and recommendations for providing falls prevention information by experts of various areas of specialisation
4. Evaluate the effectiveness of delivering a contemporary peer-led falls prevention presentation incorporating adult learning principles and behaviour change strategies on community-dwelling older adults' beliefs and knowledge about falls prevention, their motivation, and intention to engage in falls prevention strategies compared to delivering an existing peer-led falls prevention presentation