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ARTICLE

# Perceptions of older people in Ireland and Australia about the use of technology to address falls prevention

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**Abstract**

Falls are common events with serious consequences for older people. With an ageing population and increasing health-care costs, information and communication technologies (ICT) will have a potential role in future health-care delivery. However, research on technology acceptance in health care for older people is limited and its application to falls prevention is unknown. The aims of this study were to explore and describe the perceptions of community-dwelling Australian and Irish older people about their current use of technology, and the potential use of technology for falls prevention. Qualitative data were collected from three focus groups conducted in and around Limerick in Ireland, and three in the Sydney area, Australia. A total of 35 older people participated. Data were analysed using thematic analysis. Four themes emerged from the data: (a) perceptions of vulnerability to falls, (b) preferences for exercise interventions, (c) participation in and ownership of technology, and (d) perceptions about applications of technology for falls prevention. As the use of technology is an instrumental activity of daily living, health professionals need to assess the capacity of older people to adopt these technologies, and provide falls prevention interventions to accommodate the technology skills of older people. Some participants were reluctant to embrace technology and barriers to the effective use of technology to assist in preventing falls may conflict with future health service trends.

**Keywords:** accidental falls; technology; internet; instrumental activities of daily living; occupational therapy

## Introduction

Health services for older people are faced with a parallel rise in population ageing and increased costs associated with falls, alongside an unprecedented increase in the complexity of technology available to manage daily life. The range of what is included in the term *technology* is very broad and diverse, and there appears to be no clear consensus in the literature on definitions for different types of technology. Definitions include: (a) information and communication technology (ICT)

encompassing the use of email, the internet, social networking, and voice/video technology on devices such as smartphones, computers and tablets (Blaschke *et al*., 2009; Kim *et al*., 2016); (b) assistive technology or everyday technology, usually referring to devices or systems that contribute to functional capacity such as alarms and surveillance systems (Blaschke *et al*., 2009), or use of automatic bank tellers and phone messaging systems in organisations (Yagil *et al*., 2016); (c) telecare and telemedicine where ICT is used to contribute to the diagnosis, treatment, care and management of health conditions at a distance from health professionals (Tinker, 2011); (d) eHealth – described as ways to interact with some health services to solve problems (Rios, 2013); and (e) electronic assistive technology that includes environmental control systems, alarms and smart home systems (Martin *et al*., 2008). Most technology that can assist falls prevention involves an ICT component, which can benefit the delivery of falls prevention interventions or support the functional capacity of an older person at risk of falling (Martin *et al*., 2008). Therefore, in the absence of clear definitions, this paper will encompass the broad range of electronic and digital technology available to assist in falls prevention.

## The use of technology by older people

Whilst some older people are embracing ICT, there is a proportion of older people who are being left behind (Chesters *et al*., 2013), even across developed countries. For instance, in Ireland, 67 per cent of all households have a computer and internet access, but for those over 65 years, only 23 per cent have a computer, 21 per cent have access to the internet and 53 per cent have never used the internet (Hardill, 2013). ICT uptake among older adults in Australia is higher as 62 per cent have a computer at home and 54 per cent have access to the internet (Australian Bureau of Statistics, 2013). However, 46 per cent of older Australians rated their interest in the internet as low (National Seniors Productive Ageing Centre, 2011). The differences between Ireland and Australia may be due to the diffusion and application of ICT across the economy in Australia being extremely high (one of the highest across Organisation for Economic Co-operation and Development countries), compared to Ireland where dissemination has not been as fast or comprehensive (Green *et al*., 2004). Clearly, the application of technology to engage in falls prevention interventions will be hampered by the proportions of older people who may not be familiar with, or resourced with, adequate technology in the home.

Despite differences between countries in the uptake of ICT usage, the issues for older people adopting technology are similar. For instance, over two-thirds of both Irish and Australian older people describe their skill level in using computers and the internet as low. This difference in usage and capability for older people is known as the *digital divide* or the *digital gap* (Olphert and Damodaran, 2013; Rios, 2013), which is defined as 'the gap between people who can effectively use new information and communication tools, and those who cannot' (Bert *et al*., 2014: 9). This divide is often associated with age, socio-economic status and geographical area, and can lead to a form of *digital exclusion* (Tacken *et al*., 2003) as some older people do not have access to the same services that are now available online. It has been estimated that in the United Kingdom over two-thirds of digital

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exclusion is represented among those aged 65+ (Green and Rossall, 2013). The capacity to use the internet is fast becoming an essential instrumental activity of daily living (IADL) task, requiring older people to have skills in order to manage their health and wellbeing more efficiently, as well as conducting simple activities such as paying bills or finding information. However, this is rarely evaluated as part of health professional practice for older people in the community, and few IADL assessment tools include the use of ICT.

## The need for falls prevention strategies for older people in the community

Falls are a common and serious concern for older people worldwide, often resulting in poor functional outcomes, increased risk of early hospitalisation, and long-term care or mortality (World Health Organization, 2007). Falls occur in approximately 30 per cent of the general population of older people (The Irish Longitudinal Study on Ageing, 2014). Internationally, the financial burden of falls and fractures amongst older people who fall is high. Heinrick *et al.* (2010) estimated that the cost of falls is between 0.85 and 1.5 per cent of total health-care expenditure, and between 0.07 and 0.20 per cent of Gross Domestic Product. In a seminal study undertaken in Australia, it was calculated that falls prevention strategies needed to deliver a 66 per cent reduction in falls incidence to be able to contain costs over the next 50 years (Moller, 2003). However, hospitalisation rates for falls in older people have continued to increase (Australian Institute of Health and Welfare, 2017), and in Ireland, the numbers of presentations to emergency departments by older people after a fall are 1.6 times higher (Fan *et al.*, 2017). Evidence-based exercise programmes and home modification interventions are effective in reducing the risk of falls (Clemson *et al.*, 2008; Sherrington *et al.*, 2008; Gillespie *et al.*, 2012). However, uptake rates for face-to-face falls prevention programmes in the community setting have been found to be low (Day *et al.*, 2016), and the proportion of older people completing their exercise programmes are only 8–15 per cent (Merom *et al.*, 2012). As it is estimated that up to 40 per cent of falls are preventable (McMahon *et al.*, 2014) and only 10 per cent of older people have an injury associated with a fall (The Irish Longitudinal Study on Ageing, 2014), we can conclude that there are a large number of older people who fall in the community who may not be accessing falls prevention services that are offered as part of a rehabilitation or follow-up programme. Furthermore, if those who do attend in-person falls prevention programmes are not likely to maintain their engagement in preventative strategies, alternative interventions are needed.

## Technology and falls prevention

With the projected increase in the number of older people in the population and the associated increase in the number of older people experiencing falls, it is unlikely that the current face-to-face health services will be able to be meet future demand, without alternative means of health-care provision (Morris *et al.*, 2012). Technological solutions have been developed to detect, predict and prevent falls (Boulton *et al.*, 2016) and these solutions are needed to address this demand, especially in the falls prevention arena (Morris *et al.*, 2012). However, any solutions that

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involve technology require older people to have skill and confidence in using the internet, if they are to be successfully implemented.

Technologies that are applicable to falls prevention include reminders and tracking on smartphones and tablets (Mira *et al.*, 2014), monitoring of gait and physical activity via accelerometers and other devices (Ammann *et al.*, 2012; Pirinejad *et al.*, 2014; Power *et al.*, 2014), falls monitors and personal alarms (Stewart and McKinstry, 2012; Boström *et al.*, 2013), options for information exchange and education (Bert *et al.*, 2014), health professional consultations and peer support (Rios, 2013), and smart technology in the home to deliver interventions (such as exergaming or the use of computerised games to exercise) that promote physical activity, independence and safety (Morris *et al.*, 2012, 2013). The internet has also made it possible for older people to gain access to health professionals via videoconferencing on platforms like Skype™ (Rios, 2013). Telehealth has been defined as remote physiological monitoring, clinical monitoring and delivery of health services via telecommunications, sensors and the internet (Age UK, 2013). This term overlaps to some extent with the term *telecare* which often refers to monitoring devices such as fall detectors and alarms (Stewart and McKinstry, 2012), and these are combined in many applications. However, to contribute to falls prevention, these technology applications need to be acceptable to older people, available to them, likely to be adhered to and be able to be used effectively.

## The experience of older people with technology

The adoption of technologies to assist in falls prevention may be related to whether or not older people have previous experience of using technology in the workplace (Age UK, 2013). Currently, 'younger' older people (aged 55–70) are more likely to have used computers at work compared to 'older' older people (aged 70+). However, whilst some older people may not have had experience with current technology and will have to learn to use it, even those who have experience will need to keep pace with the current rate of change in the development of new technology, otherwise their knowledge and available devices may become obsolete (Wandke *et al.*, 2012). Using technology to manage health services and health delivery is known as eHealth and eHealth literacy is defined as 'the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem' (Rios, 2013: 116). Previous experience with ICT does not always translate to higher levels of eHealth literacy, which would make the uptake of ICT to support falls prevention more effective. Furthermore, the information gained needs to be accurate and there is also the risk that with older people accessing the internet more often, they might accept information from the internet without critiquing it (Leist, 2013).

There are barriers to using technology that are related to ageing. These include decreasing perceptual motor skills, working memory, visual decline, slower processing speed, difficulty selecting between relevant and irrelevant stimuli, poor dexterity and cognitive decline (Patomella *et al.*, 2011; Wandke *et al.*, 2012). Conversely, older people with age-related hearing loss may be able to communicate more effectively through internet use (Sundewall Thorén *et al.*, 2013). Whilst ageing can also

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mean more difficulty in integrating new information into an existing knowledge base, this does not mean that older people are unable to learn new things. However, with ICT there is a whole new language to learn, such as the terms used to describe computer functioning (Wandke *et al.*, 2012). Many difficulties associated with ICT use can be overcome with better design of program platforms, such as larger fonts, the use of simple rather than complex devices, easier buttons to press or touch, larger areas to click on without making mistakes and uncluttered icons (Age UK, 2013; Pirnejad *et al.*, 2014).

Some barriers may be related to the experiences of older people when they have been introduced to new technology (Hawley-Hague *et al.*, 2014). These barriers include the affordability of hardware, software or internet services, low motivation to use technology because of no perceived benefit, low skills and confidence, difficulty with mouse operations, concerns about computer viruses, privacy and fraud, and not having access to immediate support when it is needed (Patomella *et al.*, 2011; Stewart and McKinstry, 2012; Age UK, 2013; Chesters *et al.*, 2013; Wandke *et al.*, 2012). A lack of success with initial attempts to use a program or device may also be discouraging for older people, and lead to disengagement with technology and the perception that they are too old for technology (Wandke *et al.*, 2012). Some older people are reported to feel a greater sense of security and reassurance using telecare, but their confidence levels are not always improved (Stewart and McKinstry, 2012). This means that any falls prevention interventions delivered via technology would need to accommodate these barriers to their use for older people if they are to be implemented in practice.

Feedback from older people about the outcomes of their use of technology is also varied. Positive effects include better social interaction, improvements in memory and cognitive stimulation (Heart and Kalderon, 2013; Xavier *et al.*, 2014), and overcoming loneliness and isolation, by enabling older adults to maintain contact with social ties (Age UK, 2013; Cotton *et al.*, 2013). Other feedback from older people is more ambivalent; for instance, older people using surveillance systems indicate that these systems provide a sense of safety and security at home, but also an unwanted perceived loss of privacy (Boström *et al.*, 2013). Criticisms of the use of technology from older people include having more superficial relationships as a result of participating in online communities compared to traditional social contact (Age UK, 2013; Cotton *et al.*, 2013), and experiencing frustration with automated systems requiring them to 'speak' with a machine, rather than having human contact (Heinz *et al.*, 2013). Whilst some older people will adapt to using technology, if others experience discomfort, lower efficacy and less control over computing technologies this may decrease the likelihood that these technologies will be acceptable to them in the long term (Zimmer and Chappell, 1999; Heart and Kalderon, 2013). This would be a particular barrier to offering falls prevention intervention using an online platform as an alternative to face-to-face contact.

Future initiatives to promote healthy ageing and falls prevention for older people will need to incorporate the application of digital technology and e-health, yet little is known about the perceptions of the current cohort of older people about their use of technology. It is important to understand these perceptions to make effective recommendations for technology-based falls prevention interventions (Hawley-Hague *et al.*, 2014), and to determine to what extent different contexts influence these

perceptions. Therefore, this study will investigate and describe the perceptions of Australian and Irish older people over the age of 65 years about their current use of technology, and the acceptability of the potential to use technology to deliver falls prevention interventions.

## Methods

### Study design

An exploratory, qualitative description study design (Sandelowski, 2000; Neergaard *et al.*, 2009) was used, incorporating focus groups. Focus groups are useful for collecting data from a group of people where interaction occurs between participants, leading to a richer source of data compared to single interviews (Plummer-D'Amato, 2008*a*). This focus group was concentrated on opinions and attitudes from the group members about the use of technology in falls prevention and how they would feel about participating in activities using technology to prevent falls. The setting was intended to be interactive to gain as many views as possible on the topic. Focus groups consisting of four to eight participants were convened to collect primary data specifically for this study. The size of the focus groups allowed each participant to share their insights and opinions on this topic, as well as provided a diversity of perceptions (Krueger and Casey, 2009).

Inclusion criteria for the study were being over 65 years of age, living independently in the community, and being able to understand or communicate in English. Participants were recruited using convenience sampling via community groups involving older people, such as senior citizen's clubs, bowling clubs and retirement groups (from urban, suburban and rural locations). The purpose of the study was focused on falls prevention, so we did not target older people who already had conditions that would put them at high risk of falls. Rather, we sought to speak with a general population of older people where falls could be prevented in the future, and the risk of falls for this population was already at 30 per cent by virtue of their age (TILDA The Irish Longitudinal Study on Ageing, 2014). Due to differences between Australia and Ireland in published definitions of rural and urban, for the purposes of this study urban was defined as central metropolitan or city-based, suburban was defined as the outlying suburbs of a city and rural was defined as areas outside city boundaries.

Ethical approval was gained for the study from the University of Sydney, Australia and the Health Service Executive West, Limerick, Ireland.

### Data collection

Invitations to participate in the study were distributed to eligible participants via community group co-ordinators in each location (urban, suburban or rural). Consenting participants were then brought together for the focus group held at the community group location for each location. Each focus group was led by one of the authors, who had the role of guiding and managing the focus group schedule questions and addressing any group dynamics. Focus group discussions were recorded and in addition a second person was present to act as a moderator where necessary and take comprehensive notes on the discussion topics, the body

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language of participants and general observations about the group interactions. The focus groups in Australia were led by the first and second authors and in Ireland they were led by the second author and another academic staff member.

The focus group questions began with a general open question about what older people think about when they hear the term fall prevention, and follow-on questions explored the experience of participants with respect to falling, and their opinions on the best way to deliver falls prevention activities. Transition questions addressed the role of technology in the daily lives of the participants and whether they felt there was a role for technology in maintaining their health.

The focus groups incorporated a ten-minute live demonstration by the researcher of a selection of applicable technologies including (a) an accelerometer for falls detection and activity monitoring, (b) iPads with Skype™ to demonstrate communication options, and (c) online activity diaries. The content of the demonstration was the same in all locations in both Australia and Ireland, and allowed the focus group participants some hands-on experience with the technology. The fidelity of this demonstration was ensured by one researcher being present for all focus groups. The demonstration allowed study participants to understand what technological options were available for falls prevention interventions, and how they thought these would match their lifestyle and skills. However, care was taken that the benefits of technology use were not emphasised to participants, so that they could form their own opinions on the tools during the focus group. A recent systematic review recommended that technologies needed to be clearly described and clarified for older people (Hawley-Hague *et al.*, 2014), and the focus group demonstrations offered this, which is a unique component of this study. Finally, participants were asked to reflect on whether there was a role for these technologies in maintaining their health and wellbeing, in preventing falls, and how they might feel about adopting this technology. Focus groups were not strictly time limited, so allowed as much time as needed for participants to respond to the questions and trial the technologies (Plummer-D'Amato, 2008*b*). Focus groups lasted for up to 45 minutes. A total of six focus groups were conducted to increase the breadth and reliability of the data collected (Plummer-D'Amato, 2008*b*).

### Data analysis

All audio-taped discussions were transcribed, and transcripts were analysed for common themes using NVivo™. Using a process of thematic analysis (Braun and Clarke, 2006), patterns or themes were identified across the data. Analysis began by both authors reading through the transcriptions repeatedly and making notes of key issues identified by participants. Initial line-by-line coding of the entire data-set was then conducted by the first author using NVivo. Codes were then sorted, reviewed and reorganised into categories (sub-themes) and then final themes, taking into account the initial notes made about the key issues and perceptions of the participants. Examples of sub-themes and themes arising from codes are presented in Table 1.

Consistency in coding was ensured by the first author conducting the analysis of the transcripts in NVivo (Kidd and Parshall, 2000). Both authors contributed

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**Table 1.** Themes and sub-themes

| Themes | Sub-themes |
|---|---|
| Perceptions of vulnerability to falls | Effects of falling |
| | Environmental risks |
| | Need to be careful |
| | Contribution of other people to falls risk |
| Preferences for exercise interventions | Types of exercise |
| | Facilitating exercise remotely |
| Participation in and ownership of technology | Perceptions of technology |
| | Games |
| Perceptions about the application of technology for falls prevention | Accelerometers |
| | Medication management |
| | Personal alarms |

to the rigour of data analysis by engaging in independent consensus coding of the transcripts and interpretation of the final themes through a process of peer debriefing. Both authors are allied health professionals with an interest in falls prevention and the use of technology amongst older people. We were aware of the potential for our interest in the use of technology and falls prevention to influence our interpretation of the data. Therefore, we engaged in extensive discussions around the interpretation of the themes and re-checking the data to ensure our interpretation reflected the data.

## Results

### *Participants*

Three focus groups were held in Ireland (Limerick) and three were held in Australia (Sydney), and included four to eight participants each. In all locations efforts were made to obtain the views of older people living in a range of geographical locations (urban, suburban and rural areas). All participants were aged over 65 years and 33–35 per cent reported a fall in the previous year (*see* Table 2).

There were 20 participants from Australia, aged 65–96, of whom four were men and 16 were women. All the 15 Irish participants were female, aged 68–82, and did not report as many falls as the Australian participants. However, no Irish participants reported undertaking any falls prevention activities and only 10 per cent of Australian participants did.

### *Qualitative themes*

Four main themes emerged from the data: (a) perceptions of vulnerability to falls, (b) preferences for exercise interventions, (c) participation in and ownership of technology, and (d) perceptions about applications of technology for falls prevention.

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**Table 2.** Characteristics of focus group participants

| | Number of participants | Age | | Gender | | Reported a fall in the past 12 months | | Participated in a falls prevention programme | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Range | Male | Female | Yes | No | Yes | No |
| Australia: | | | | | | | | | |
| Urban Sydney | 8 | 92 | 84–96 | 2 | 6 | 4 | 4 | 1 | 7 |
| Suburban Sydney | 6 | 75 | 65–83 | 1 | 5 | 3 | 3 | 0 | 6 |
| Rural outer Sydney | 6 | 74 | 65–80 | 1 | 5 | 0 | 6 | 1 | 5 |
| Total | 20 | | 65–96 | 4 | 16 | 35% | | 10% | |
| Ireland: | | | | | | | | | |
| Urban Limerick | 7 | 78 | 70–82 | 0 | 7 | 1 | 6 | 0 | 7 |
| Suburban Limerick | 4 | 73 | 68–77 | 0 | 4 | 1 | 3 | 0 | 4 |
| Rural outer Limerick | 4 | 74 | 69–77 | 0 | 4 | 3 | 1 | 1 | 3 |
| Total | 15 | | 68–82 | 0 | 15 | 33% | | 0% | |

### *Perceptions of vulnerability to falls*

If older people are going to adopt any form of technology to support falls prevention, it is important that they perceive some degree of risk that they may be vulnerable to falling. Participants tended to associate environmental features with their falls risk and often referred to aspects of their home environment or the public environment that they believed put them at risk of falling. One key area was clutter, with one person suggesting that the 'clutter police' (Focus Group (FG) 1, Australia (Aus), Participant (P) 1) were needed to monitor clutter in homes as this contributed to a risk of falls. Participants acknowledged that clutter is in a person's own home and that 'it's their own personal space so it's hard sometimes because people have it the way they like to have it' (FG2, Ireland (Ire), P2), which may mean that the presence of clutter is hard to resolve. Another participant suggested that even if older people tolerated clutter in their own homes, this was not the case in public areas, for instance:

> if the supermarket was like our houses we wouldn't stand for it. (FG1, Aus, P3)

Another area of concern was lighting, for instance:

> The problem is when you can't see something you don't know what you can't see. (FG1, Aus P2)

Finally, other participants identified the ground and floor surfaces as areas of concern, for instance:

> There was a gap in the footpath and I kept watching the ground and as I lifted my head I was gone. (FG2, Ire, P2)

> I have a rug on the landing – covering a telephone wire. (FG3, Aus, P1)

Participants also suggested that their falls risk was related to the behaviour of other people around them, by enabling them to be distracted and even by being knocked over by other people. One participant concluded that they needed to be more careful and vigilant in order to avoid falls by keeping their 'wits about me' (FG1, Aus, P1). Others blamed rushing for their falls, or making unwise decisions. For instance:

> Getting up on a chair is very dangerous. It's stupid. (FG2, Aus, P1)

> It can be bravado. I used to think I'd be able to do everything at one time. (FG2, Ire, P3)

As falls were perceived by participants to be related to environmental issues and behavioural choices, it is important that any technological interventions are also focused on these issues.

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### Preferences for exercise interventions

Participants indicated preferences for in-person exercise programmes for falls prevention, and suggested that virtual programmes delivered online by a health professional at a distance were an inferior version. For instance:

> You'd have the feeling you were second best. (FG2, Aus, P8)

The direct relationship with a health professional was highly valued by the participants. This has implications for designing a feasible and acceptable technology-based falls prevention intervention that would not be viewed as of less value than an in-person programme.

Some participants also thought engaging in exercise programmes alone would be too boring for them to sustain, believing that in-person programmes would provide them with more incentive to continue with the exercise. For instance:

> If you weren't doing the exercises you'd feel fairly guilty if you were with the person. (FG2, Aus, P4)

Therefore, incentives to adhere to an exercise programme delivered at a distance would be needed to be successful. In-person exercise programmes were also perceived as a safer option by participants, as some balance exercises were perceived as difficult to conduct alone, and many participants indicated that they also had space limitations at home for exercises.

### Participation in and ownership of technology

Adoption of falls prevention interventions via technology will depend on how familiar and confident older people are with everyday technology. Participants were most familiar with mobile telephones, television (TV) and DVDs, but were less familiar with computers and computer programs. Participants also expressed a preference for more simple devices rather than the current smartphones that have diverse capabilities:

> I think the older you get technology seems to be harder – mobile phones for example – you can't get ones to just ring out and get a message. The simpler the better. (FG2, Aus, P3)

This was believed to be related to finding it harder to learn how to use new technology that they had not had experience of, due to their age:

> Being older it would take a while to get the hang of it – we don't adapt as quickly as children do with these modern things. (FG1, Aus, P5)

It was also acknowledged that they needed help from younger people to adopt technology:

> Where is a teenager when you want one? (FG3, Ire, P1)

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Some participants expressed a feeling of being intimidated by new technology, and felt that they compared badly to younger generations who have grown up with access to technology:

> Us sensitive scared people – we will die out and there'll be all people who know about it [technology] – in the future it will be wonderful. (FG1, Aus, P5)

Faced with these challenges, some of the participants felt that they did not see the need for the technology because of their age, so therefore did not need to learn how to use it:

> When you reach a certain age you've a whole different thought system going on up here. You'll say to yourself, I don't really need it. (FG3, Ire, P2)

Other participants felt upset and excluded from many services and products available because of their lack of access to technology:

> What annoys me is to listen to TV programmes that say if you want to know more go to WWW. What about the majority of older people who have not got computers? (FG3, Ire, P1)

Several barriers to the take-up of technology were identified by participants. These involved their perceptions about the expense of technology, as well as their lack of familiarity with technology leading to a sense of alienation about technology. One participant firmly stated:

> I wouldn't go out and get an iPad if you paid me! (FG3, Ire, P4)

This suggests that for this participant, there was no incentive for them to adopt technology that required the use of an iPad, and that they did not value this technology. Participants identified the need for them to be able to learn to use technology at their own pace and that manuals were insufficient. Participants also needed some assistance from someone who understood technology and they expressed a lack of confidence in being able to manage the technology alone.

### *Perceptions about applications of technology for falls prevention*

A variety of potential technology applications for falls prevention were presented and demonstrated to participants as part of the focus group discussion. Having a remote intervention from a health professional instead of attending an appointment had mixed feedback, with participants suggesting that this would be of more interest to older people in rural areas, and that there were certain social benefits to consulting with health professionals in person. A preference was also expressed for using the TV for these sessions rather than an iPad.

Personal alarms and falls detectors were viewed as having low aesthetic acceptability by participants:

> They are the ugliest looking things I have ever seen in my life! (FG1, Aus, P3)

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If participants had one of these devices, they tended not to wear them, whilst others felt that they were not old enough to need one. Most participants felt they had to use one because of the encouragement and preferences of other family members, but some participants still felt that these devices were difficult to operate correctly.

Participants generally accepted monitoring technology such as accelerometers, if devices could be worn on the waist or in a pocket. However, many participants doubted that general practitioners would have time to review all the incoming data if information was sent to them, which negated the need for the device. Participants felt that there was less need for devices to manage medication use as medication was often packaged for daily dosages by the pharmacist and medications were dated.

Participants were less interested in gaming technology such as Wii programs, as they perceived these games were too mentally demanding for them:

> Young people like that, but I don't think older people are mentally geared to follow games. (FG1, Aus, P6)

> I have tried but didn't know what we were playing. (FG1, Ire, P3)

There were not any obvious differences between Irish and Australian perceptions of technology and falls, and opinions expressed by participants were very similar.

## Discussion

This study sought to identify the perceptions of a population of older people living in the community about their use of technology, and the potential of such technology to contribute to falls prevention. Participants may have been influenced by what was presented to them during the focus group demonstrations which, in turn, may have directed the findings of the study. However, the discussions were facilitated to include perceptions of a broad range of technologies, and in common with other studies, there was a significant level of ambivalence amongst the study participants around the utility of technology and their capacity to adopt it. There was evidence of a *digital divide* for these participants and some examples of *digital exclusion* (Olphert and Damodaran, 2013), indicating that particular attention needs to be given to the needs of older people as technology continues to advance in the health context into the future. It cannot be assumed that all older people will have a positive relationship with technology, despite the benefits perceived by health-care providers of introducing technological solutions.

The speed of technological change and its application to daily life means that adequate access to technology is becoming more of a fundamental individual right for everyone, including older people (Age UK, 2013). Often the use of ICT is a component of daily activities, and an individual's capacity to use this technology will determine their functioning at home and in the community, and choices for health service delivery (Melrose *et al.*, 2016). IADLs are classified as more complex everyday tasks, such as using the telephone or managing finances, and according to the 'Occupational therapy practice framework: domain and process' document (American Occupational Therapy Association, 2017), IADLs should include the use of mobile and smartphones, computers and tablets (Melrose

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*et al*., 2016). However, standardised IADL assessments, such as the Lawton IADL assessment (Graf, 2008), rarely include activities that require skills in ICT. IADL assessment is important in evaluating the functional abilities of older adults and IADL performance is believed to be related to a wide range of cognitive processes, and can detect any early cognitive impairment (Gold, 2012). However, it is also common practice for health professionals not to use standardised assessments, instead more informal assessments are used (Wales *et al*., 2016) which may also exclude an assessment of activities requiring the use of ICT. Therefore, if health professionals are to assess and assist adequately older people living in a community where ICT skills are required, they will need to be much more aware of the perceptions of older people and their capacity to use ICT. Findings from this study suggest that many older people living in the community will not be confident about using ICT or open to using technology to deliver falls prevention services, and health professionals may need to offer more help to facilitate older people to use technology as part of their interventions.

Most study participants were older women, therefore some of the findings could be related to gender differences in the use of, and attitudes to technology. Generally, there are more older women than older men in the community, yet more women than men have not used the internet (Ratzenböck, 2017; Xie, 2003), and are less confident about using the internet than men (González *et al*., 2015). With respect to using technology to support falls prevention, this is of significance as older women tend to experience more falls, live longer, have higher levels of chronic health problems, report more difficulty with functional activities yet have less resources in older age (Tinker, 2011). Conversely, older women are reported to be willing and able to use ICT to communicate with their families and friends, to maintain their independence and develop their social identities (Ratzenböck, 2017; Xie, 2003). Differences in access to and use of technology may be due to differences in life experiences between older men and women such as education, paid employment and expectations about caring responsibilities which may have influenced the exposure that older women have had to ICT (Kim *et al*., 2016). Men are reported to use communication technology more frequently than women and were more likely to use the internet for dealing with personal tasks and health matters (Kim *et al*., 2016). These findings may account for the attitudes expressed in the study participants who were predominantly older women.

The finding that study participants preferred personal contact with a health professional is consistent with findings in the literature where older people were found to use the internet to understand health concerns better, but would not replace this with personal contact with a health professional (Rios, 2013). However, in a study investigating personalised physical activity feedback delivered via the internet without personal contact from a health professional, physical activity did increase in the oldest age group (Ammann *et al*., 2012). It is not known if the older people in this study would have preferred personal contact or not, despite the outcomes being successful.

The reasons given for non-use of technology from the study findings are also reflected in the literature, such as technology being perceived by older people as irrelevant to their everyday lives, and older people feeling they are too old to adopt new technology, or lack the skills to do so (Patomella *et al*., 2011). Older

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people need to see the benefit of adopting technology in order to overcome the challenges to learning how to use it. Wandke *et al.* (2012) suggest that many older people are more interested in what the output of computer technology is for them rather than the technology itself. If their perception of the usefulness of the technology outweighs their feelings of inadequacy around technology, older people are more likely to incorporate technology into their lives (Heinz *et al.*, 2013).

The study findings also confirmed the *digital gap* experienced by older people, and changes are needed to improve eHealth literacy for older people if they are to be able to maintain their health and use services more efficiently through technology (Rios, 2013). One European example is the Grandparents and Grandchildren program, where young people assist older people to improve their digital literacy (Grandparents and Grandchildren, nd). Technology can be very useful for older people to participate in more social contact, but to achieve this, help is needed at the start of technology use, and for some assistance and reassurance needs to be ongoing (Age UK, 2013). The availability of non-threatening computer training is fundamental to resolving the digital divide for older people. Some older people have more barriers than others in using computers and technology, and this is influenced by socio-demographic background and past education. The level of self-efficacy in using technology experienced by older people is also a key motivator for putting effort into using and learning the technology, and will help overcome any negative emotions when using technology (Alvseike and Bronnick, 2012). The use of role models that older people can more easily identify with could assist in promoting confidence in using technology. Unfortunately, relying on younger people with an existing passion for technology to engage older people may not be an effective way to build the self-efficacy of older people using technology.

The literature is consistent in suggesting that the design of technology contributes to the digital divide for older people. For instance, websites may be poorly designed or difficult to navigate (Age UK, 2013; Macfarlane *et al.*, 2012) and some technology is not very simple or easy to use (Patomella *et al.*, 2011). Touch screens may be beneficial as control becomes easier for older people, and less hand–eye co-ordination is required without the need for a mouse or cursor. Despite increasing numbers of older people using technology, their use may be at a more superficial level. Results from a survey (Malinowsky *et al.*, 2015) indicated that older people tended not to use technology for searching for products or information, online purchasing or online banking. Therefore, it might not be expected that older people would easily adopt technology for health care-related purposes (Heart and Kalderon, 2013). Despite the availability of gaming devices such as Nintendo Wii and Wii fit balance board and dance mats, studies with healthy older people have identified issues with safety, assistance needed to use them effectively and some adverse effects of using them, such as pain (Morris *et al.*, 2012).

Clearly, health professionals have a role in enabling older people to engage with technology more effectively in order to maximise their instrumental activities of daily living and to gain access to alternative health-care delivery options. Sanders *et al.* (2013) reported on a programme run by occupational therapists to provide computer training for older people that consisted of four one-hour sessions with independent work in between sessions. All the programme participants

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achieved their goals for being able to conduct computer tasks, there was a significant increase in levels of comfort using computers and participants felt productive as a result of the programme. However, it is unclear from the literature how common these programmes are and what levels of skills health professionals have in prescribing technology for older people. For instance, accelerometers have the potential to provide health professionals with information about mobility and gait patterns in older people that could assist with falls prevention, but their use is limited by the knowledge and experience of health professionals in using these devices (Culhane *et al.*, 2005). In other studies, only a third of Irish occupational therapists felt able to prescribe computers and environmental control systems (Verdonck *et al.*, 2011), and in Australia, over half of survey respondents had never prescribed any devices listed on the survey to assist wayfinding for older people with dementia (Jarvis *et al.*, 2017). Occupational therapists have traditionally had a role in prescribing assistive devices, and as technology is continually evolving to develop new options that can assist older people, occupational therapists need to maintain currency with what is available to support meaningful occupations (Verdonck and Ryan, 2008). As skills in prescribing technology are central to the role of occupational therapists and other health professionals, more technology-related content needs to be incorporated into professional entry and post-professional education.

## Limitations of the study and recommendations for future research

Whilst the qualitative design of the study enabled an in-depth investigation of the perceptions of small groups of older people about the use of technology in falls prevention, the findings may not be representative of older people in general in either country. The use of focus groups may also have prevented some participants from contributing to the discussions. As recruitment was via community groups for older people, older people who were not members of community groups could not be included, and may have had alternative perceptions if they were more isolated. We did not gather information on the socio-economic status of the focus group participants so it is unknown if some of the findings may be related to this or not. Access to resources and past education is known to be a key factor related to technology uptake, access and use (Tacken *et al.*, 2003), and should be considered in future research.

As many government and other institutions such as banks are closing opportunities for direct in-person service contact and providing more online opportunities for transactions to take place, it is imperative that more research is conducted to establish the effect this has on older people, especially those who do not have internet access or ownership of a computer. For instance, in Australia, online access to government service portals such as MyGov and My AgedCare is encouraged. If a *digital gap* exists for older people, as suggested by these findings, the uptake of technology-based falls prevention interventions and education programmes will be limited. Further research to design technology-based falls prevention interventions that are acceptable to older people and more likely to be adopted in practice is needed. Furthermore, when health professionals assess IADLs with older people in their care, it is essential that access to and use of the internet and other

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technologies is included. Therefore, research into the content and application of IADL assessments is needed, as well as any interventions to improve the use of technology by older people.

## Conclusion

As government policy is focused on developing alternative service delivery models that are supported by technology, the reluctance of older people to embrace technology fully and the barriers to their effective use of technology to assist in preventing falls may work in opposition to current and future health service trends. Promoting the adoption of technology by older people will mean the need for health professionals to facilitate self-efficacy for individual older people in using computers, and occupational therapists have a key role to play. Use of technology needs to be viewed as a fundamental IADL to support engagement in meaningful occupations. The design and delivery of future technology-based falls prevention interventions needs to account for the needs of older people using the technology, such as designing simple platforms for ICT programmes, to ensure that the *digital gap* apparent in the findings of this study are overcome.

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