Human-centred design research during the pandemic: Using an online survey to inform personas of women at risk of hip fracture

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During the global pandemic, social distancing rules made it difficult to conduct human-centred research into hip fracture protection, and in-person focus groups were abandoned. An online survey was developed to safely gather insights from people living with osteoporosis who are at risk of fragility fractures. The survey data informed the design of five personas that provide a critical lens to drive innovation in hip protector garment design and evaluate ongoing concept development. Although the pandemic disrupted people-facing research, the use of survey data provided a greater breadth of voices to inform the personas than focus groups alone.

Keywords: hip protector; survey; persona; covid-19

Introduction

This paper reports on research activity undertaken through a practice-based PhD titled, Innovation in hip protector design: challenging function, meaning and context. Hip fractures are a major cause of long-term disability and can lead to a rapid decrease in healthy life years, especially for older people. They are the most common reason for older people to need emergency anaesthesia and surgery and the most common cause of death following an accident (Royal College of Physicians 2018). The annual cost of medical and social care for all the hip fracture cases in the UK is about £2 billion (National Clinical Guideline Centre 2011). Women are four times more likely to suffer a hip fracture than men due to higher instances of osteoporosis and longer life expectancy (Parker, Gillespie, and Gillespie 2006).

Hip protectors, consisting of underwear with integrated pads over the hip joint, can reduce the risk of fracture when worn consistently (Santesso, Carrasco-Labra, and Brignardello-Petersen 2014). However, long term adoption of these products is low due to aesthetics, discomfort, difficulty in use, and acceptance of fall risk (Sims-Gould et al.

2014). Although women are at higher risk, they are underrepresented in the design of current underwear hip protectors which are often aesthetically and functionally better suited to men (Sims-Gould et al. 2014; Doherty et al. 2004). The PhD research challenges the existing medical model for the design of hip protectors, typically perceived as 'assistive technology', and questions how human-centred design practice can inform new designs of hip protector garments that address these issues.

The PhD project has run from October 2017 until October 2023. In March 2020, when the first UK lockdown occurred due to the Covid-19 pandemic, the research was at a critical stage of recruiting participants to take part in focus groups. These would involve older participants discussing hip protectors face-to-face and handling physical samples and prototypes. The constraints enforced through social distancing rules made it impossible to continue the research this way.

Initially, 'personas' were to be developed to help inform the design of new types of hip protectors. Personas are imaginary characters that represent different user archetypes based on real people who have engaged with the research practice (RCA 2011). The personas help to focus the design practice on the specific needs and desires of users and provide a useful tool to evaluate design concepts. It was intended that the data gathered through focus groups would inform the design of the personas. Although three focus groups were conducted before the pandemic began, there was not enough data gathered to develop a meaningful range of personas.

The constraints presented by the national lockdowns made the development of personas an even more critical part of the research process as engaging with actual participants became more challenging. To gain further insight into attitudes towards existing hip protectors – accommodating social distancing rules – an online survey was conducted, targeting members of the Royal Osteoporosis Society (ROS). A rich

qualitative and quantitative data set was generated from the 156 responses, but the findings also helped to inform the development of a series of personas. Currently, there is a broad discussion on data-based personas but there is a lack of research in the literature relating to designing later-life personas (Schäfer et al. 2019). The development of personas that specifically focus on older people addresses this issue, whilst using survey data to provide a greater breadth of voices to inform the personas than could be achieved by focus groups or interviews alone.

Methodology

The online survey gathered 146 responses from women but only 9 responses from men, and 1 response from a non-binary man. The high proportion of female respondents reflects the higher instances of osteoporosis found in women. It may also simply indicate that women are more highly represented within the ROS membership, however, data protection laws prevent the ROS from sharing information about the gender or age of their members. They were an appropriate sample group for the research as people with osteoporosis, a disease that causes low bone mass and deterioration of bone tissue, are at higher risk of fragility fractures (NICE 2017).

The survey was anonymous, and respondents were notified at the start that by completing the survey they were providing consent for the information they provided to be used in the study. Ethical approval for this research was granted by the UAL Research Ethics Sub-Committee (RESC).

The survey was designed to examine whether the contexts of gender, age, history of hip fracture, and the respondents' own perceived risk of falls, have a bearing on the attitudes, and acceptance, of hip protectors. Two different types of hip protector were presented in the survey: the Fall Safe underwear hip protector and the HiP padded belt hip protector that can be worn over clothing. These were chosen to investigate the

preferences of hip protectors hidden under clothing or worn visibly over clothing. The responses were systematically analysed using ATLAS.ti qualitative data analysis software (Scientific Software Development GmbH 2022) and coded according to statements that qualify as design criteria. Norman's (2005) three levels of design interaction – visceral, behavioural, and reflective – provided a meaningful way of organising the codes into distinct categories. The visceral level of a design is concerned with its visual appearance and our immediate response to it. This is where the meanings of a product are read and interpreted. The codes generated from comments about the visual appearance of the hip protectors were categorised into the 'visceral group'. The behavioural level relates to the effectiveness of use of a product, how well it fulfils its intended purpose. The codes relating to the perceived function or performance of the hip protectors were categorised into the 'behavioural group'. Finally, the reflective level is where the meanings of an object are placed in the context of the user; what does using or owning the object 'say' about the user? How does it reflect their self-image, status or invoke personal meaning? The codes related to comments about how the hip protector would make an individual look (especially to others) and feel were categorised into the 'reflective group'. This qualitative insight, and answers relating to context of use and style, revealed patterns that helped to inform preferences and characteristics to shape the personas.

It was important to create personas that represented users at different life stages. Older age is a risk factor for hip fractures but conditions such as osteoporosis can create risk for younger people too. Psychologists, such as Erikson (1963), have theorised the different stages of the life course, attempting to map psychosocial development from childhood to old age. More recently, Cohen (2005) has explored the psychology of old age within the wider context of adult development, and determined that age should not

be a barrier to living creative and meaningful lives (see Figure 1). His framework has four phases starting from a midlife revaluation, or ‘quest’, and builds to a final ‘encore’ phase, living well to the very end. The language used in this approach reflects positive attitudes towards ageing and views it as a holistic part of adult life. This is a useful tool when considering hip protector users, different contexts, and scenarios of use.

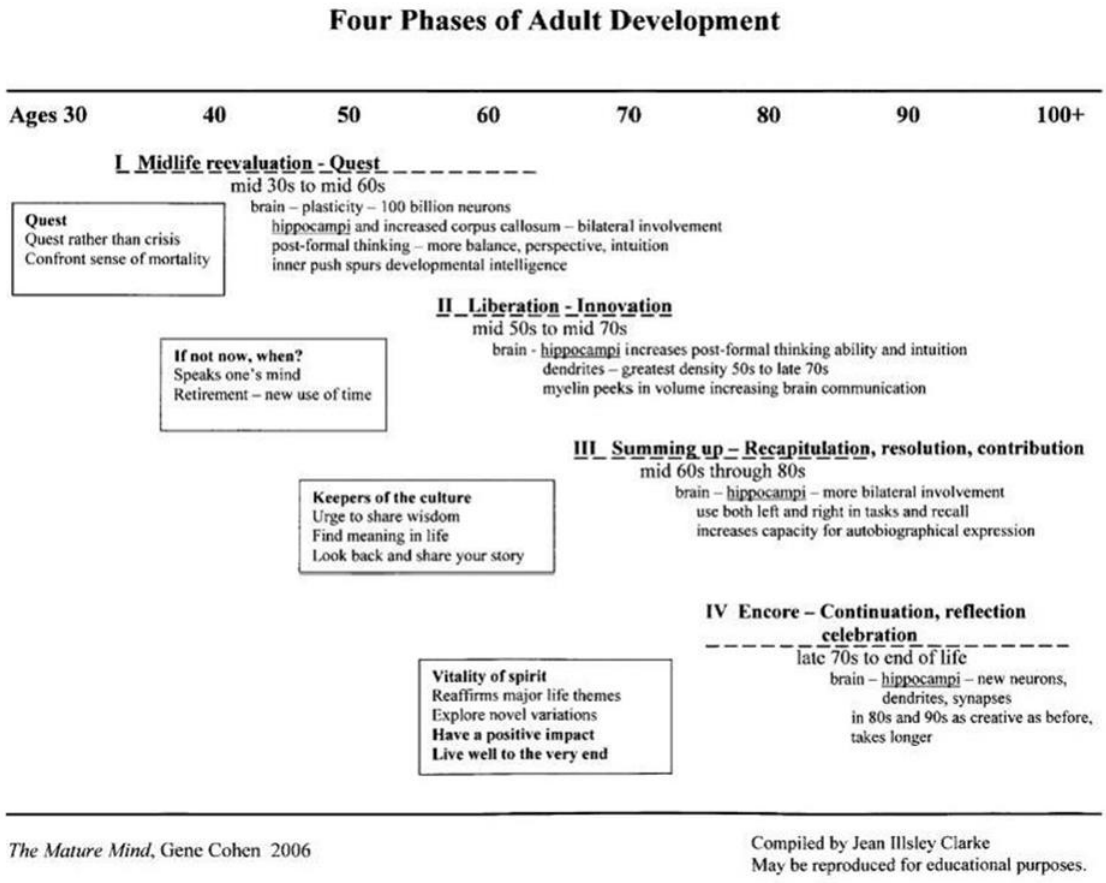


Figure 1. Cohen. 2006. Four phases of adult development.

For example, products designed for people living in the final phase may have different needs and desires compared to a person in the ‘liberation’ phase who may be at risk because of osteoporosis or arthritis. Framing the personas this way, an opportunity to challenge ageist attitudes can be mediated through the development of new designs for

hip protection, inclusive of younger and older people, that reflect positive messages about ageing.

Persona details such as personality, interests, and social environment, were also shaped by comments made in the survey and narratives identified through earlier focus groups and later telephone interviews. Images of women that represent the personas, and other contextual lifestyle images, were purchased or sourced royalty-free from stock photography websites and used within their licensing rules. Quotations were paraphrased, or taken directly from the survey responses, to shape the personas' attitudes towards hip protectors. A persona template, developed by Nesta (2014), was adapted to accommodate three statements:

- How I feel about hip protectors
- Why I'm interested in hip protection
- What I want from a hip protector

Responses to these statements reflect the lifestyle and life stage of the five personas created to engage with Cohen's framework. It is this aspect of the personas' development that is presented below.

Results

Older survey respondents tended to prefer hip protectors that were discreet and hidden from view. When asked what changes to the appearance of the underwear hip protector would make it more appealing, a higher proportion of women aged 70 and over provided responses in the visceral and reflective categories (see Table 1). Similarly, 65% aged over 70 (n=26) would prefer to wear a hip protector hidden under clothes, compared to 46% of women aged 59 and under (n=18) (see Table 2). Conversely, 56% of women aged 59 and under (n=22) would wear a style of hip protector that was visible

over their clothes if they liked its appearance, compared to only 33% aged over 70 (n=13) (see Table 3).

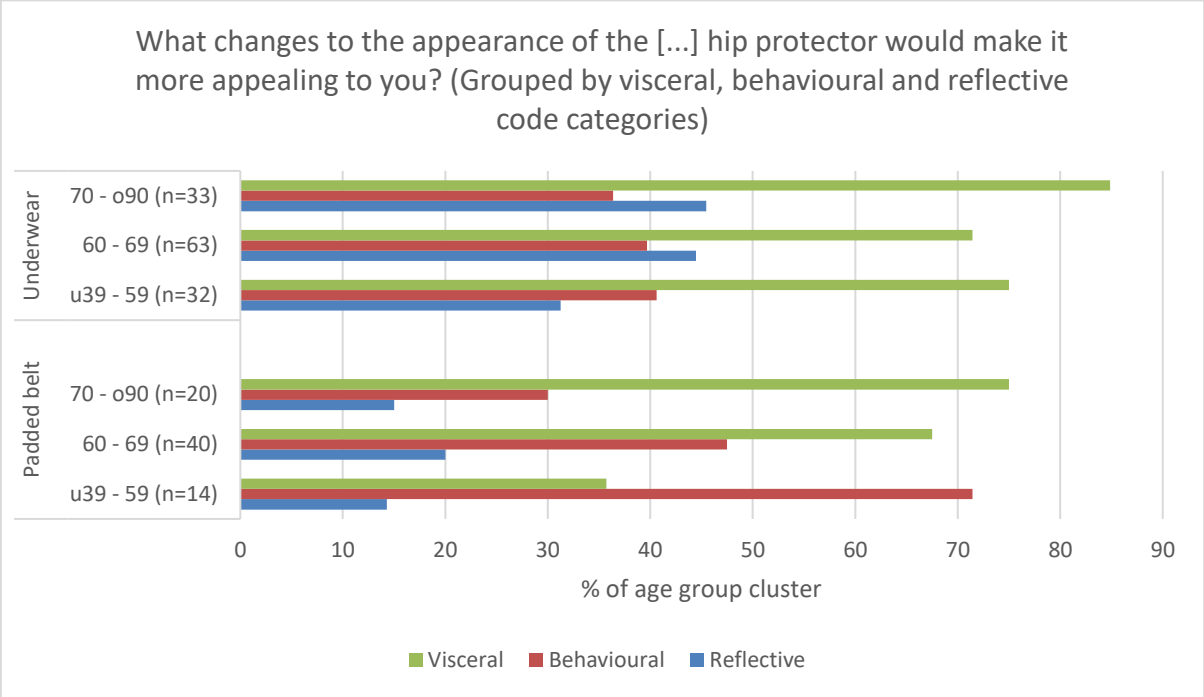


Table 1. Comparing visceral, behavioural, and reflective categories of codes in response to suggested changes to the appearance of hip protectors, clustered by age

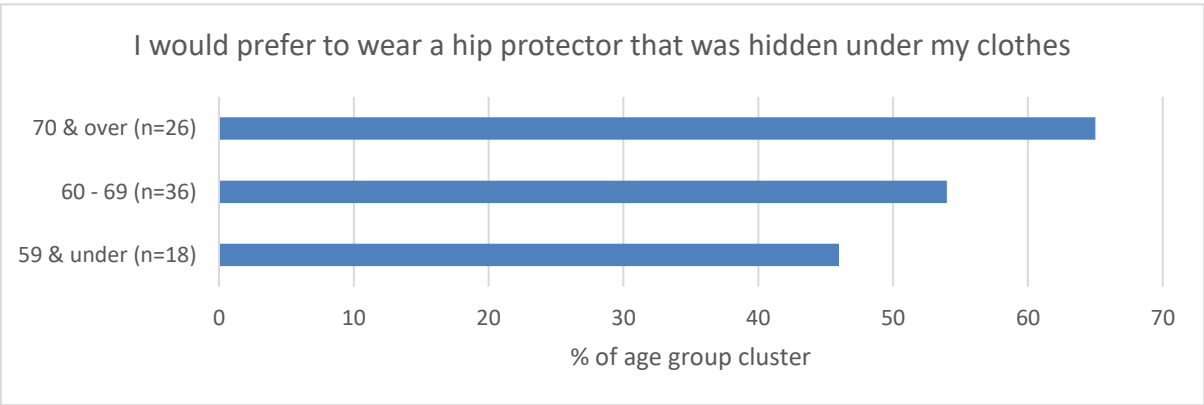


Table 2. I would prefer to wear a hip protector that was hidden under my clothes. Responses clustered by age

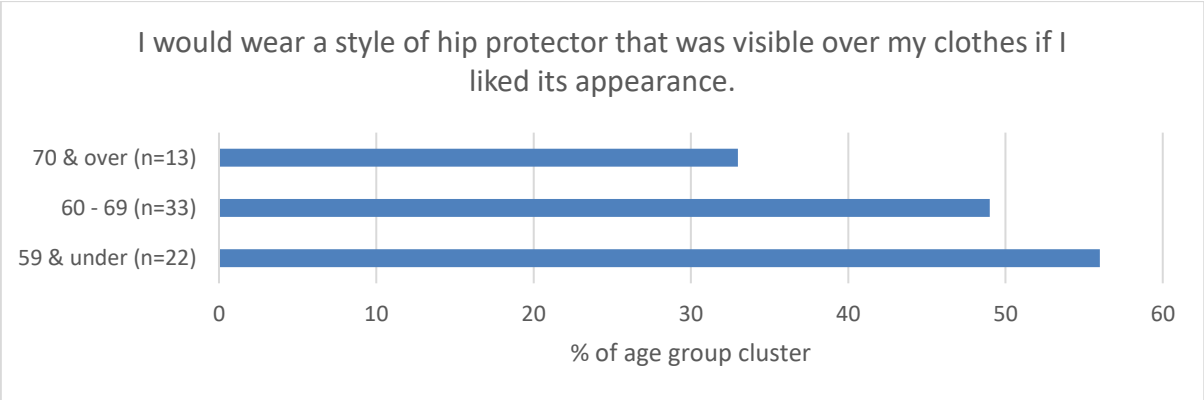
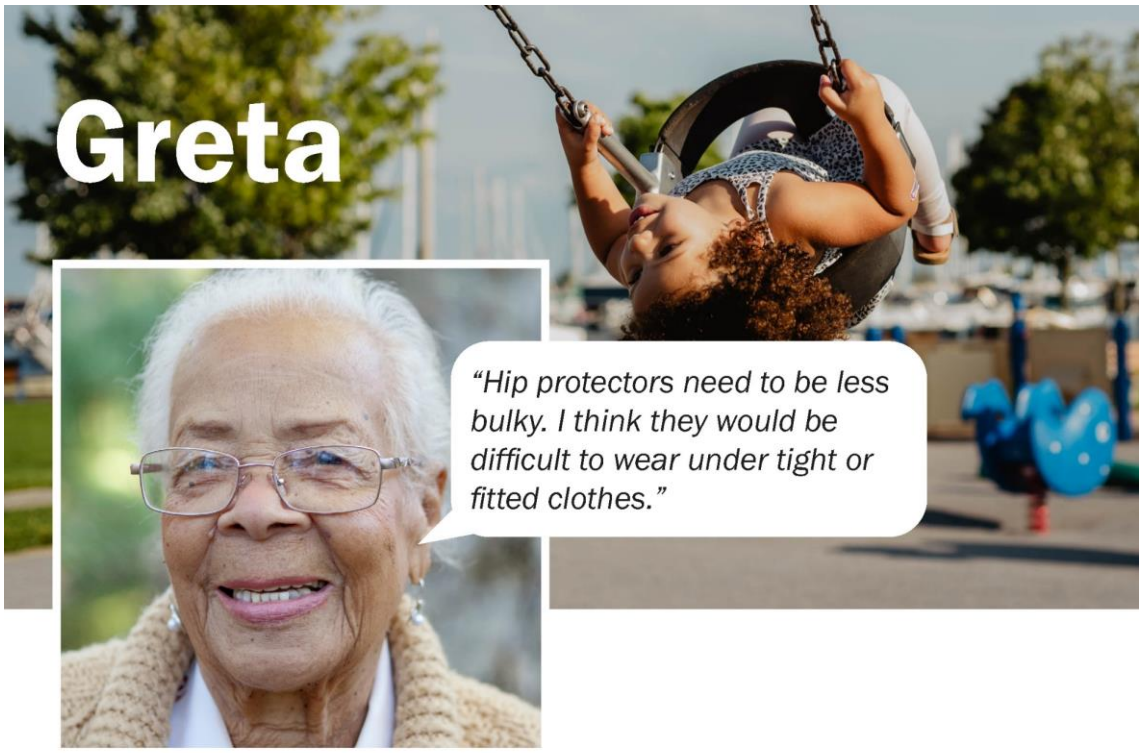


Table 3. I would wear a style of hip protector that was visible over my clothes if I liked its appearance. Responses clustered by age

This translated into the persona development: For example, Greta, a 77 year old retired teacher (see Figure 2), has fractured her hip once before. She would value the peace of mind of a hip protector, especially when out with her grandchildren, but notes how important it is that you can't tell it is being worn, and that they're comfortable and effective. Nancy is in the 'Encore' life phase and has recently moved into an assisted living apartment. She is concerned that the minor falls she has experienced could become more serious. She would prefer to wear a hip protector hidden under clothing, but comments that they need to be much more slimline. Wendy is a younger woman who works full time, in the 'Liberation' life phase, and living with osteoporosis. She is style conscious and is more receptive to clothing with integrated hip protection designed in a chic way.

Younger respondents tended to reflect more on the function and performance of hip protectors. When asked what changes to the padded belt hip protector would make it more appealing, 71% of responses from women aged 59 and under (n=14) were in the behavioural category, with only 30% of responses from women aged 70 and over (n=20) in the same category (see Table 1).



Audience
Summing up phase - aged mid 60s through 80s.

About
A 77 year old retired teacher who lives with her husband. They rely on a fixed income and have to budget carefully.

Personality
A reliable and supportive person. She truly enjoys helping others but sometimes overcommits and is unwilling to ask for help herself.

Interests
Has a keen interest in the arts and enjoys theatre and music. She began painting and drawing in later life.

Social environment
Family is very important to her and she is a dedicated grandmother. She has one or two close friends but mostly spends time with her husband, children and grandchildren.

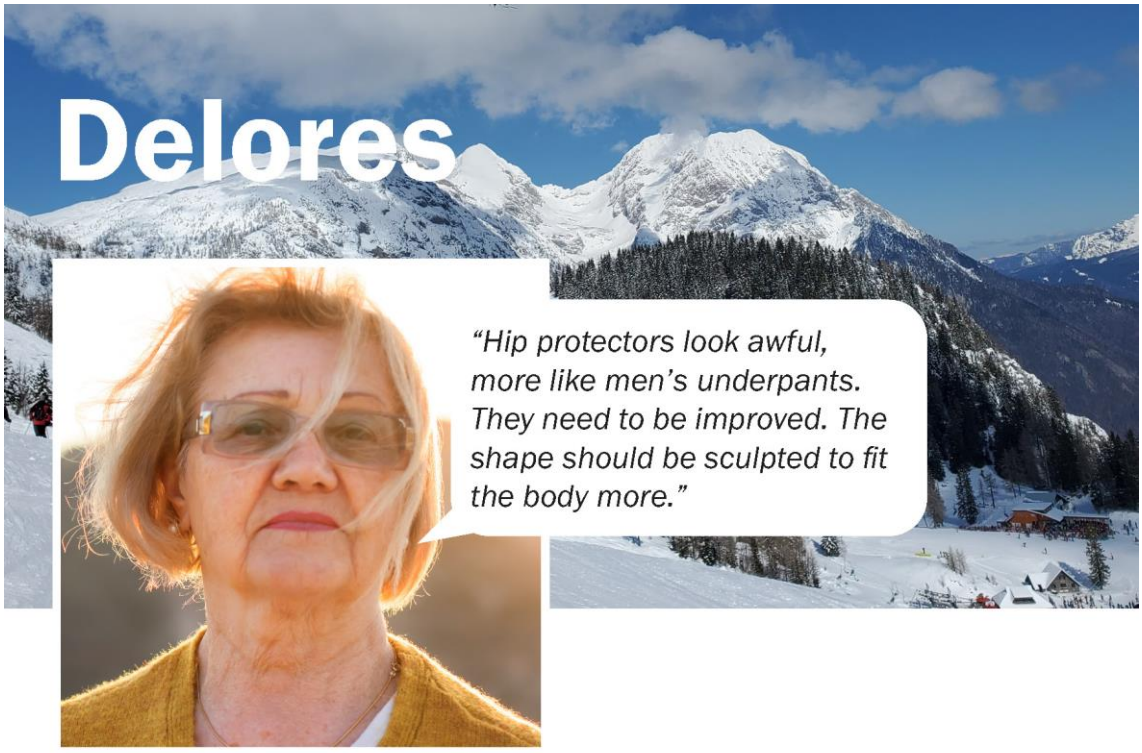
Why I'm interested in hip protection...

"I'm aware that age is a risk factor but I also have severe osteoporosis. Last year, I fell and fractured my hip."

What I want from a hip protector...

"The most important thing is that you can't tell a hip protector is being worn, and that they are comfortable and effective. Some peace of mind when I'm out and about would be good."

Figure 2. Example of the persona 'Greta'.



Audience
Liberation phase - aged mid 50s to mid 70s.

About
A 66 year old, recently retired environmental consultant who lives alone. She is looking forward to spending more time relaxing and enjoying life.

Personality
Warmhearted and approachable, with an altruistic spirit and a friendly disposition. She can be a little unfocused and disorganised at times.

Interests
Has always lived an active life, loves being outdoors and travelling. She learnt to ski as a teenager which is a passion that has remained with her since.

Social environment
Recently separated and looking to forge new connections and friendships. She regularly meets for walks with a local ramblers group.

Why I'm interested in hip protection...

"I had an unexpected fall last year that has really affected my confidence. I was also recently diagnosed with osteopenia."

What I want from a hip protector...

"Cyclists wear padded shorts when sitting on a saddle. I was thinking that the hip protection might look something like that. Something that would not affect your exterior appearance and with a woman in mind - like a legging."

Figure 3. Example of the persona 'Delores'.

Emma, aged 42, is the youngest persona and in the 'Midlife Re-evaluation' phase. Although her health condition affects her balance and mobility, her role as an occupational therapist also gives her insight into the difficulties older people might face. For example, she observes that people with limited dexterity might struggle to get a hip protector on or off if it's too tight. Her involvement in the community farm underpins her suggestion for hip protectors worn over clothing to include integrated pockets.

Many of the respondents, even into older age, continue to lead very active lifestyles. For example, 38% of women aged 70 or over (n=40) said they would wear a hip protector whilst exercising, and activities such as walking (i.e., rambling or hiking), skiing and cycling were also reported. This is an opportunity for the personas to challenge ageist ideas about lifestyle and being "too old" to do certain activities.

Delores is 66 years old and is a keen skier (see Figure 3). She has always lived an active life and enjoys the outdoors and travelling. She is very critical of existing hip protector designs, noting that the shape should be better sculpted to fit the body. She suggests looking to padded cycling shorts as a potential hip protector solution that would not affect your exterior appearance.

Discussion

The survey data has provided key insights to inform the development of personas at different life stages. When suggesting ways hip protectors could be improved, visceral and reflective responses appeared to become more likely with age, although the opposite was true for behavioural responses. A greater emphasis on the visual appearance of the garment, and how one appears to other people, perhaps reflects internalised ageism and the highly negative ways older women have learnt to evaluate their bodies and appearance (Hurd Clarke 2010; Twigg 2013). The younger respondents

were more greatly represented in the lower fall risk categories. One explanation for their bias towards behavioural responses could be that issues such as comfort and performance are seemingly more pressing for a group who are more likely to only wear hip protection when knowingly engaging in higher risk activities. These trends are reflected across the five personas developed. The development of personas that specifically focus on older people also addresses the lack of representation relating to designing later-life personas in the literature (Schäfer et al. 2019).

There are some limitations to the approach, however. For example, the survey questions were developed to explore attitudes towards hip protectors but not explicitly designed with the aim of creating personas. Survey questions, especially relating to personality and lifestyle, could be included to help build the profiles more directly.

Access to online surveys is not wholly inclusive as some of the target audience may be without internet access or lack digital literacy skills. In addition, whilst the target audience of ROS members provided insights from people living with osteoporosis, it is not representative of wider populations at risk of falls. Surveying other target groups and providing paper-based or in-person responses after lockdown restrictions ended, would help in both regards.

Men are also at risk of hip fracture but a very low response rate (n=9) in the survey made it difficult to generate male personas. Similarly, the opportunity to explore non-gendered hip protection could be developed much further. Again, widening the target survey sample would help to develop this.

Overall, this way of developing the personas has extended the breadth of exploration and interpretation of the survey data. By closely scrutinising the qualitative data and reimagining the voices of the respondents through these fictional archetypes, the survey analysis has cultivated tangible ‘human centred’ outcomes that go further

than presenting the findings through charts and graphs alone. Putting people at the centre of the design process is vital for the inspiration and evaluation of new hip protector design concepts. When mapping the personas against these concepts, we can ask, for example, how might Greta or Nancy's needs differ from Emma's? We may also explore how the visual language of other types of protective clothing – particularly sportswear conveying action, adventure, or empowerment, often marketed towards younger users – could be appropriately diffused upwards towards older users at risk of falls.

Conclusion

The survey has helped to inform the development of a rich collection of personas that represent women at different life stages, and reflect the trends identified through the analysis of the data. Targeting members of the ROS provided meaningful feedback from a group particularly at risk of fragility fractures, including women represented through Cohen's four phases of adult development. This overcame constraints relating to social distancing but was also a more holistic approach to developing personas than relying only on focus group or interview data.

The five personas created provide a critical lens to drive innovation in hip protector garment design and evaluate ongoing concept development. The voices represented through the personas challenge the visceral, behavioural, and reflective attributes of existing hip protectors. In doing so, they question: how do we shift the perception of hip protectors from garments of dependency to garments of empowerment?

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