

Digital Transformations in Care for Older People: Critical Perspectives

Edited by
Helena Hirvonen, Mia Tammelin, Riitta Hänninen
and Eveline J.M. Wouters

First published in 2022

ISBN: 978-0-367-72557-0 (hbk)

ISBN: 978-0-367-72559-4 (pbk)

ISBN: 978-1-003-15531-7 (ebk)

Chapter 5

Ageism in applying digital technology in healthcare

Implications for adoption and actual use

Ittay Mannheim, Yvonne van Zaalen, and Eveline Wouters

(CC BY-NC-ND 4.0)

DOI: 10.4324/9781003155317-7

This OA chapter is funded by Stichting Fontys, Netherlands.



 **Routledge**
Taylor & Francis Group
LONDON AND NEW YORK

Ageism in applying digital technology in healthcare

Implications for adoption and actual use

Ittay Mannheim, Yvonne van Zaalen, and Eveline Wouters

Introduction: using digital technology in care for older adults

Many discussions, studies, and policy reports regarding ageing and digital technology (DT) begin by addressing the following logic: the population is rapidly ageing, leading to an increase in chronic diseases and increasing costs and burden on the healthcare system (Neven, 2010). DT is often presented as an answer or a solution to this ‘problem’ in what Peine and Neven (2019) described as ‘interventionist logic’. However, older adults are often categorised and discourses as a homogeneous group of ‘non-users’ in the context of designing DTs (Quan-Haase et al., 2018), associated with illness, frailty, cognitive decline, and dependency (Neven, 2010). These conceptions, together with the notion that as people age they consume’ as much as three times more healthcare resources than others (Alemayehu and Warner, 2004), leads to a fixation on DTs developed primarily for care and healthcare for older adults (Schulz et al., 2015). This is often policy-driven due to the idea that DT has the potential to reduce healthcare costs. This fixation has led to a rapidly growing age-tech market of healthcare DT, as can be seen in a visualised mapping of age-tech companies currently operating in the market (see Etkin, 2021). Consequently, healthcare professionals and caregivers are positioned at the forefront of using DT with older adults.

For the purpose of this chapter, we describe DT as technological devices, services, or platforms that use, collect, and often process data, and are connected to the Internet, other devices, or apps. Examples of such DTs are eHealth apps, smart watches, sensors and systems that can detect and predict falls, and social robots, among others. The benefits of DT for the older population are commonly stated to improve well-being, quality of life, support independent ageing in place, and improve care and healthcare (Czaja, 2017; Mynatt and Rogers, 2001; Neves and Vetere, 2019; Schulz et al., 2015; Sixsmith, 2013). However, they can also lead to social inequalities and the exclusion of older adults (Neves and Vetere, 2019) due to sociodemographic differences (such as lower income, education, and living in rural areas), lack of social support (Reiners et al., 2019), and low involvement of older people in the development of DT (Mannheim et al., 2019). More

so, despite the aforementioned potential, adoption rates and the feasibility of using such health-related DT are still considered low (Czaja et al., 2013; Nelson-Kakulla, 2020) and DTs are often abandoned after little use (Greenhalgh et al., 2013). Several research projects around the world have tried to understand non-adoption of DT by older adults in general (Czaja et al., 2006; Heerink et al., 2010; Peek et al., 2014), and specifically in the context of healthcare (Greenhalgh et al., 2017). Some technology acceptance models further concluded that older age is considered to be a determinant of user acceptance of technology (Venkatesh et al., 2003). However, it also seems that there is a discrepancy between what older adults want to use and what is designed (Peek et al., 2015), as older adults might want DT for more than just healthcare, for example, DTs that are enjoyable and empowering (Astell, 2013). Furthermore, the reasons for use (or non-use) of DT by older adults are more complex (Peek et al., 2014).

Generally, there is an increasing body of literature emphasising the heterogeneity of older adults and understanding that digital divide, or non-use of DT, is not only a matter of chronological age. Rather, there are intersections with other socio-economic characteristics such as education, income, gender, and living setting (Neves and Vetere, 2019; Reiners et al., 2019), as well as individual preferences, emotions, the influence of social networks, and interactions with others (Peek et al., 2014; Luijkx et al., 2015; Lee and Coughlin, 2015; Peek et al., 2019). Nevertheless, it seems that there is still a strong orientation to ‘classic’ determinants of acceptance, namely ease of use and perceived benefit (more in-depth theories on adoption of DT can be found in Chapter 2). The pitfall of this perspective, as will be elaborated on in this chapter, is firstly that, when it comes to ease of use, older adults are usually viewed as less able or incompetent. Secondly, which DTs are considered to be beneficial and how they are designed to be used is often determined by mostly young designers and with low involvement of the older end-users (Mannheim et al., 2019), who often hold a different perspective compared to other stakeholders (van Boekel et al., 2017; van Boekel et al., 2019). More so, a recent development in theory emphasises the influence and interaction between mutual perspectives (including negative and stereotypical) of different stakeholders and the design of DT on shaping how older adults use DT and which new DTs are perceived as needed (Peine and Neven, 2020).

Unfortunately, the heterogeneity of older adults in relation to DT is not always considered in research, design, and policy discourses. The definitions of ‘old age’ in research and policy involving DT often vary from 50+ to 75+. More so, upper age limits are often applied for participants. For example, some surveys about Internet use, such as the statistical office of the European Union (Eurostat),¹ have no collected data from people above 74 regarding questions about Internet use, without an apparent reason. Nevertheless, recent studies have begun to doubt these stereotypical assumptions about older adults being a homogeneous group, suggesting a possible influential role of ageism on use and adoption of DT (Choi et al., 2020; Cutler, 2005; Mannheim et al., 2019; McDonough, 2016; Köttl et al., n.d.; Mannheim et al., 2021; Rosales and Fernández-Ardèvol, 2020).

In this chapter, we illustrate the proposed theoretical factor of ageism in relation to DT. We start by defining ageism and considering what is actually known about how and why older adults use DT, often shattering established stereotypes of older adults as unable to use, or learn to use, DT. We then give specific attention to ageism in healthcare, as the majority of the age-tech market focuses on healthcare DT. Finally, we provide examples from latest advances on ageism in the use and design of DT and present two potential ways to explain how ageism can influence the use and adoption of healthcare DT.

Ageism: a new theoretical determinant of use and acceptance of DT in healthcare?

Ageism

In order to begin to understand the possible role of ageism in use and adoption of DT, both in general and in healthcare specifically, we first define ageism and illustrate the possible manifestations and consequences related to technology and healthcare. Subsequently, we further elaborate on possible determinants that can help explain how ageism can influence the use and adoption of DT.

Ageism is commonly defined to comprise stereotypes, prejudice, and discrimination towards a person based on their age (Ayalon et al., 2019; Iversen et al., 2009). In order to understand what this actually means, it is important to break down this definition. According to Ayalon et al. (2019), stereotypes reflect a cognitive component of how we think about ageing and older adults. For example, a belief that older adults are not capable of using certain healthcare-related DT. Prejudice reflects an emotional component of what feelings we have about older adults in different situations. For example, lack of patience, anger, or frustration, when needing to explain to older adults how to use a certain DT. Finally, discrimination represents the behavioural component. For example, not offering a DT-based treatment to an older adult or only discussing use of the DT with a family member instead of with the person themselves.

Ageism can also have (so-called) positive aspects, such as entitlement for social benefits, offering a seat to an older person (Palmore, 1999), or perceiving older adults as kind (Cuddy et al., 2005). However, ageism has mainly detrimental and negative consequences, and even so-called positive aspects are questioned. For example, some might view social benefits as a ‘burden that might drain limited resources’ (Ng et al., 2015) or being overly kind as a form of benevolence (Cary et al., 2017), patronising or ‘pitying positive’ (Tornstam, 2006).

Ageism can manifest in different life domains and contexts such as healthcare or the workforce (Kornadt and Rothermund, 2011). It influences how older adults are viewed and interacted with by individuals, in the media, daily language and culture, and by employers, healthcare professionals, policymakers, and designers of DT. Most of these topics have been studied and represented in recent issues about ageism (e.g. Ayalon and Tesch-Römer, 2018). However, the role and

manifestations of ageism in relation to DT as a unique domain of ageism did not receive enough attention until recently (to be detailed in the next section).

Stereotypes about age (and technology) are socially constructed, learned, and internalised throughout the life course. This happens through viewing media (Loos and Ivan, 2018), reading news (Allen and Ayalon, 2020), or everyday language such as ‘I’m too old to use technology’ or ‘technology is for young people’ (Neves and Amaro, 2012). This can influence how healthcare professionals, family members, and service providers treat older adults, and can even be internalised by people as they age, leading to embodiment and self-ageism (Levy, 2009). The internalisation of ageism happens throughout the life course, and often operates and is activated implicitly (Levy, 2009; Levy and Banaji, 2002). Stereotype activation often influences our judgements without us being aware of it (Bargh, 1994) or without intention to do harm (Abrams et al., 2011). Nevertheless, ageism may have harmful consequences among older adults, for longevity (Levy et al., 2002), loneliness, and social participation (Shiovitz-Ezra et al., 2018), as well as health outcomes (Wurm and Benyamini, 2014).

A common general stereotype about older adults is that they are less competent (Cuddy et al., 2005), and simply presenting a question about ‘old’ or ‘young’ can lead to stronger associations with negative traits relating to age (Perdue and Gurtman, 1990). Concerning the use of DT, older adults are often categorised and portrayed as ‘laggards’ (Essén and Östlund, 2011), non-users (Quan-Haase et al., 2018), and technophobic (Nimrod, 2018). However, contrary to these stereotypes, accumulating evidence suggests that older adults are increasingly using DT (Nelson-Kakulla, 2020), have mainly positive attitudes towards technology (Mitzner et al., 2010), and find technologies to be interesting and empowering (Wu et al., 2015). However, negative and stereotypical attitudes of others, such as family members, caregivers, or healthcare professionals, might influence the way in which DT is used by older adults (Mannheim et al., 2021).

Ageism in healthcare

As previously mentioned, a great deal of DT for older persons is developed in the context of care and healthcare. It is therefore imperative to discuss unique aspects of ageism in healthcare. There is considerable evidence of ageist attitudes and practices among healthcare providers, both self-reported and patient reported. They are reflected in communication with patients, diagnostic decision-making, and types of treatment offered to patients (Wyman et al., 2018). Such evidence is found across different health professions and healthcare contexts, such as neuropsychological tests (Ben-David et al., 2018), physiotherapy (Ambady et al., 2002), psychological assessment (Linden and Kurtz, 2009), and treatment of sexual function in older age (Gewirtz-Meydan and Ayalon, 2017; Langer-Most and Langer, 2010). More importantly, negative age stereotypes were found to influence diagnosis, prognosis, and treatments provided. Patients with similar symptoms or complaints are often diagnosed differently or misdiagnosed because of their age. Some examples

can be seen in a study by Linden and Kurtz (2009); the same case description (differing only by age) led to a diagnosis of depression for the younger patients and of dementia for older patients. Ambady et al. (2002) found that distancing and non-verbal communication of physiotherapists during treatment (e.g. looking away from the person) was associated with short- and long-term physical decline of older patients. Unfortunately, simply manipulating the presented age of the patient might affect decisions regarding willingness to initiate treatment, expected prognosis, and treatment trajectory (Gewirtz-Meydan and Ayalon, 2017; Uncapher and Areán, 2000). Recently, during the COVID-19 pandemic, discussion was also raised regarding the use of chronological age in triage strategies and the influence of ageism on medical decisions (Previtali et al., 2020).

These different manifestations and mechanisms of ageism further affect the opportunities older adults receive for equal participation and access to services, such as healthcare (Swift et al., 2017). Subsequently, this raises the question of how the use of DT in healthcare for older adults is affected by ageism, and whether ageism might influence the administration of healthcare DT to older adults or the manner it is used.

A suggested pathway between ageism and the use and adoption of DT

Age is defined and constructed through social practices and interactions, policies, and artefacts such as technology (Wanka and Gallistl, 2018). The latter, however, points to the notion that the field of gerontechnology is generally devoid of theory, and as demonstrated earlier in this section, age is considered a barrier to using technology in a very general manner, considering older persons as a homogeneous group. In a recent publication, Peine and Neven (2020) summarise over a decade of research on the relation of STS (science and technology studies) and age studies, and attempt to suggest a model which they call CAT (co-constitution of ageing and technology) (see also Chapter 2). They suggest that four different arenas mutually influence (co-constitute) each other in determining what DTs are designed and how they are used. These ‘arenas’ include the life-worlds of older people, design worlds, technological artefacts, and images of ageing. More specifically, Peine and Neven illustrate how designers have an idea of what older users are like (user representations), which is often based on stereotypes or ‘myths’ about ageing. Furthermore, developed technologies include implicit ‘scripts’ as to how they should be used. For example, a DT that is designed to be used by a family member immediately ‘scripts’ that the older adult is less involved and is not part of the decision-making process. Such implications of design often reorganise or define the technological–social environment, and vice versa, the way older adults eventually use DT, or change the use of DT for their own needs, reshapes and defines how other people view older adults in relation to DT, and what is subsequently designed.

In the given examples above, it is demonstrated how ageism, socially constructed throughout the life course, influences various life domains, such as

healthcare. Additionally, we suggest that the context of DT is a unique domain in which ageism manifests and further influences how DT is used and adopted by older adults. More specifically, we posit that the influence of ageism on use and adoption of DT operates in two main manners. The first, through the stakeholders involved in how DT is used, such as healthcare professionals who are at the forefront of using healthcare DT with older adults, family members who often provide support, designers who develop new DTs, and policymakers who often architect the social-technological environment. Importantly, older adults themselves are also important stakeholders who are not only affected by ageism of others, but might also hold self-ageist perspectives that influence how they use DT. The second manner is through the design process of DT, which determines what DTs are actually available, shaping our digital environment and further determining interactions between the different stakeholders. As in Peine and Neven's (2020) model, these two manners also interact and can possibly influence one another. Stereotypes and images of older adults and DT that different stakeholders involved in the design process hold are incorporated into the design of DT, for example.

In the next section, we attempt to further demonstrate this connection between ageism and use and adoption of DT by providing evidence from current studies. To further illustrate this proposed theoretical model, we give several examples of how ageism operates through these two ways.

Manifestations of ageism in the use and design of DT

Currently, literature drawing this direct line between ageism and DT is scarce. Therefore, the examples hereafter mainly derive from our own work on identifying ageism in the use and design of DT, conducted as part of a Horizon 2020 Innovative Training and research Network (ITN) 'Euroageism',² as well as work of colleagues of the 'Euroageism' network and other recent studies. It is not our intention to provide in-depth detail of each study but rather to provide an overview of recent developments in the field of ageism and DT.

The stakeholder pathway

The manner in which DT is used can be influenced by the various stakeholders involved (older adults, family members, healthcare professionals, designers of DT, policymakers, etc.). This pathway relies significantly on learned and internalised stereotypes about age and technology. As previously discussed, such stereotypes are communicated and internalised in our daily lives in the way we learn about social roles and norms, for example, through the media. These internalised stereotypes thereafter can be easily triggered in a way that is mostly implicit (Levy and Banaji, 2002). Importantly, these stereotypes can unknowingly influence the way we think and our behaviour (Bargh, 1994). This can happen from the slightest cue, such as merely presenting the word 'old'.

As we all age, every person is susceptible to experiencing ageism. However, ageism is still somewhat socially accepted (Cuddy et al., 2005; Officer and de la Fuente-Núñez, 2018) and the probability of (at least explicitly) experiencing ageism is higher than the probability of experiencing sexism or racism (Ayalon, 2014). The ‘easiness’ of expressing ageism is therefore not only implicit and ‘natural’, but it can often happen without the intention to do harm, or even with good intentions (Abrams et al., 2011, Cary et al., 2017). This social norm, which is also accepted by older adults themselves to some extent (e.g. indeed believing that technology is for young people), may lead to a low perception of older adults’ abilities to use DT and perhaps to exclusion of using certain technologies.

Perspective of healthcare professionals

As an example, two studies by Mannheim et al. (2021) assessed the attitudes of healthcare professionals (e.g. physiotherapists, speech therapists, and physicians) towards older adults’ abilities to use DT and how ageism is related to these attitudes. The first study presents the development of a scale to assess the attitudes towards older adults’ abilities to use technology (ATOAUT). The scale comprised ten items that assessed stereotypes (e.g. ‘Using digital technology is harder for most older adults’) and prejudice (e.g. ‘One needs a lot of patience to explain to an older adult how to use digital technologies’) towards older adults and DT. Additionally, an indirect measure was developed in which participants read vignettes describing healthcare DTs (e.g. rehabilitation app, smartwatch, virtual personal assistant) and rated the probability that people from different age groups could use them. Ageism was measured using the Fraboni ageism scale (Fraboni et al., 1990). Negative attitudes towards older adults using DT (ATOAUT) correlated with higher levels of ageism, and the belief that age is a barrier to the use of DT. It was found that participants in this study rated adults from the age of 50 as much less able to use healthcare-related DT compared to younger adults, possibly suggesting that a ‘threshold’ (Kornadt and Rothermund, 2011) to what is considered old when it comes to DT can be as young as 50. Older age groups (65–79 and above 80) were ranked as even less able than the 50–64-year-old group. In the second study by Mannheim et al. (2021), participants were randomly assigned to rate the probability of a young person (25 year old), or an old person (75 year old), to use healthcare DT. Old age salience in the beginning of the study was thereafter found to moderate the correlation between negative attitudes towards older adults using DT (ATOAUT) and ageism. More negative ATOAUT was correlated with higher levels of ageism only for those participants who were initially asked to rate the probability of an old person using health-related DT. This implies that merely thinking about older adults can trigger bias in what we think about older adults’ abilities to use technology.

These findings raise some crucial and disturbing questions. If older adults (even as young as 50) are perceived as much less capable of using health-related technologies, do healthcare professionals equally offer technology-based

treatments to older adults as they would to younger adults, as found with non-technological treatments (Gewirtz-Meydan and Ayalon, 2017; Linden and Kurtz, 2009; Uncapher and Areán, 2000)? If professionals don't believe that older adults have the motivation or ability to learn how to use new DT, do professionals have the patience to explain the use of such interventions, or do they only approach a younger family member? Do these attitudes influence the design of DT if these professionals participate in co-designing them?

Perspectives of older adults and designers of DT

The role of such intergenerational interactions between older adults, younger family members, and professionals has been discussed as important determinants of the use and adoption of DT (Luijckx et al., 2015; Peek et al., 2014). Such interaction can be empowering and may have positive outcomes and increase use and adoption. However, when stereotypes about older adults' abilities to use DT interfere, this can also lead to prejudice and emotional responses, such as anger and impatience, and to discriminatory actions, such as avoiding explanations or excluding older adults from participating in the process of acquiring technology all together. A recent study by Mannheim et al. (2020) investigated focus groups with community dwelling older adults who participated in co-designing DT as part of a collaboration with a technological hub developing DT for older adults. Five main themes were identified, revealing the perspectives of the participant on how ageism influences the design process of DT and how older adults use it. There were three themes generally related to the influence of ageism: (1) perceptions of technology in relation to age, (2) digital divide, accessibility, and willingness to learn, (3) emotions and motivation. Two additional themes that directly discuss the design process (4) 'The Ultimate Partnership' – the perceived role of older adults in co-design, and (5) the experience of co-design will be shortly elaborated on in the next section where we discuss the design pathway. Older adults strongly emphasised the perception of age and intergenerational differences in technology use as well as stereotypes and perceptions about 'the third age'. They often mentioned that while they are trying to close the (digital) gap, have motivation to learn, and stay updated and relevant, they also have to deal with how others (such as family members and the designers) view them as incompetent and technologically stuck behind, and the influence this might have on their use of DT or how it is designed.

Further, they emphasised how older people are often categorised (as younger people often are) and considered as a homogeneous group. This can lead to a misconception about older adults' abilities, but more so, might lead designers or policymakers to consult with older adults who have different needs than what a DT or service intends to meet (e.g. using healthy independent older people for a fall detection sensor system).

Nevertheless, the participants in Mannheim et al. (2020) also described how internalised ageism and stereotypes can be generated by the older adults

themselves and influence their motivation and actual use of DT. Mainly, they described fear and anxiety from using DT, which has also been addressed by others as technophobia (Nimrod, 2018). They also related these fears to shame, of how they would be seen and treated by others due to lacking knowledge or making mistakes with technology that would present them as weak or dependent (Mannheim et al., 2020).

Indeed, internalised stereotypes about ageing and technology from older adults themselves act as a pathway that influences the use and adoption of DT. In another example, Köttl et al. (in progress) explored the narratives of 15 older adults, identified as ‘non-users’, on the use of everyday information and communication technology. Internalised age stereotypes were discussed by the older adults in relation to their subjective experiences of using DT and interacting with their social environments about it. More so, they also related to negative feelings that often emerge in relation to some DTs where use is associated with negative age stereotypes and stigma. Similarly, (non)use of DT in everyday life, in a highly digitalised environment, can influence one’s self-perception of ageing in the long run (Köttl et al., 2020). Because peoples’ own perception of ageing can have future implications for their health (Levy et al., 2002), it is important to promote empowerment and education to age-friendly environments.

However, it is also important to consider that negative age stereotypes and ageism in general, and not only DT related, can have detrimental implications on the use of DT. Choi et al. (2020) found that negative self-perceptions of ageing, as well as the general experience of age-based discrimination, may lead to lower use of the Internet. Interestingly, this was found to differ according to gender, with women more affected by negative self-perceptions of ageing and men more affected by experienced age-based discrimination. Additional gender effects may appear in different patterns of experiencing negative age stereotypes and technophobia. For instance, Xi et al. (in progress) found that manipulating the framing of intergenerational contact (close compared to distant) led to more negative self-age stereotypes among men compared to women. Interestingly, these effects were found by manipulating the framing of new DT as presented in advertisements. This suggests that the design itself (and the way it is advertised) might elicit ageism and influence the usability of the DT, as also suggested by Peine and Neven (2020).

The design pathway

Deriving their ideas from the field of science and technology studies (STS), scholars such as the French philosopher Bruno Latour, Peine, and Neven (2020) emphasise a ‘Latourian divide’ in which on one side are engineers, entrepreneurs, and designers who are invested in the research and design of DT, and on the other side social scientists who strive to understand the social aspects and lives of older adults. Between these two, there is a gap in which the abilities of older adults, their wants and needs, and the way that older adults interact with these DTs are

often missed. As previously discussed, age-tech or gerontechnologies (technologies focusing on older adults) are often designed based on the implicit association between being old and needing care (Peine and Neven, 2019), and hence focus primarily on care and healthcare.

Due to ageism, older adults are often excluded from the process research and design of DT (Mannheim et al., 2019). However, any form of inclusion of older adults does not mean that the process of design is ‘ageist-free’. In a current scoping review, Mannheim et al. (in progress) aim to understand how older adults are actually involved in co-design. Papers on co-designing DT with older adults, found in seven databases (Pubmed, CINAHL, ACM Digital library, Ageline, Web of Science, PsycINFO, and Co-design journal) were screened. From 1,128 studies, 70 eligible studies were identified during a peer-reviewed selection process. Nineteen studies were excluded due to explicitly excluding (in fact discriminating) older people from the design process. Interestingly, 37 studies were excluded as the DTs were not actually designed with older adults. Rather, older adults were found to be often involved in the last stage of design, namely the evaluation phase of an already developed prototype, where the ability of older adults to actually influence the design and use is limited. The majority of the included papers indeed focused on healthcare DTs and generally discussed challenges of ageing in relation to chronic conditions, frailty, and independence. Ageism was found to be a latent variable within the design process, reflected in the (late) phase and type of (minimal) involvement in the design process, ageist descriptions, ways of incorporating feedback, and use of unrepresentative sampling. Interestingly, though not many studies reported co-design processes in which older adults are involved throughout the whole design process, many studies mentioned the importance of involving older adult end-users in order to design DTs that match their wants and needs and increase acceptability.

From the perspective of older adults who participated in co-designing DTs (Mannheim et al., 2020), it was clearly described that the ideal form of involvement in the design process should be from the beginning and throughout the whole process, in a way that can assure that the DTs designed are relevant and avoid wasting money on unneeded and unused DTs. The ‘ultimate partnership’, as they described it, implied that their involvement is more than just participants in a study, but rather experienced advisors and partners whose opinions should influence the design of the final product. Additionally, participants linked between the experience of ‘partnership’ and involvement in the design process and their evaluation of the probability that the designed DT would fit their needs and actually be used.

Conclusions and implications of DT-related ageism

When scoping the literature about research and development around ageing and DT, it is clear that the main focus has been on a specific aspect of ageing, namely living independently, with an emphasis on the need for care. As illustrated in the

previous sections, research has focused on how to enhance the use of these DTs. The main attention of many of these studies was on the older adults themselves: their abilities, socio-economic background, and assessing negative (as opposed to positive) attitudes towards DT as determinants of use and adoption. However, recent studies (Choi et al., 2020; Köttl et al., 2020, n.d.; Mannheim et al., 2019, 2020, 2021, n.d.; Xi et al., n.d.) have started to point to an alternative prospect of understanding the use of DT by older adults. Specifically, we have identified that there is a gap between what is designed and what older adults actually need and want. More importantly, different forms of ageism might be a major influencing factor on what and how DTs are designed, how intergenerational communication about DT is, and how they are actually used by older adults. This means that the psychological process of stereotyping and prejudice about ageing that influence younger, as well as older, adults might be the dominant factor that determines inclusion of older adults in the design process, discrimination in DT-based treatments, and perhaps also older adults' own decisions to not use DT. This leads to several implications for research, practice, policy, and design of DT.

Implications for practice in healthcare

The literature presented in this chapter, and specifically the example of Mannheim et al. (2021), on attitudes of healthcare professionals towards older adults' use of DT raises the concern that DT-based ageism might lead to discrimination in the way older adults receive (or don't receive) treatments that involve DT, as found with non-technological treatments (Gewirtz-Meydan and Ayalon, 2017; Linden and Kurtz, 2009; Uncapher and Areán, 2000). Healthcare professionals were found to have highly negative attitudes towards the technological abilities of older adults. This might be due to the fact that healthcare professionals are mainly exposed to older adults who are ill or suffer from chronic conditions (Thorncroft et al., 2007; Jones et al., 2008). However, since most DTs for older adults focus on care and healthcare, there is a real concern as to how effectively these new developments can be implemented.

Activation of stereotypes often occurs with low (or no) awareness (Bargh, 1994). However, controllability of repercussions and discriminatory aspects can develop through acquiring knowledge that contradicts stereotypes, social interaction, and belief-based learning processes (Peters and Gawronski, 2011; Gawronski et al., 2008). Focusing on positive interactions (Corrigan et al., 2012) and providing pedagogical training might offer positive outcomes in reducing ageism in healthcare (Chonody, 2015). Nevertheless, such training of healthcare professionals is still lacking in curriculums and the esteem of working with older patients is still low (Kydd et al., 2014). Education has recently been suggested in the global report on ageism (WHO, 2021) as one of the preferred strategies to overcome ageism, together with intergenerational contact interventions. Further, combining these two strategies seems to provide the most effective outcome (Burnes et al., 2019). We therefore suggest that training should focus on learning about the

diversity of older adults and raise awareness of how age-based stereotypes might affect our behaviour. In addition, as healthcare professionals are at the forefront of using DT with older adults, specific training could be developed to provide healthcare professionals with tools on how to communicate, train, and empower older adults to use healthcare DT.

Implications for the design of DT

There is an increasing call to involve older adults in the design of DT in order to increase usability and acceptance (Gustafson Jr et al., 2016; Hakobyan et al., 2015; Hong et al., 2014; Howes et al., 2019). However, through our conceptualisation of how ageism might influence the design process and the stakeholders involved, we identify three main problems in doing so. First, excluding people from research and design because of their age is still a socially and ethically acceptable practice (Mannheim et al., 2019). Second, when older adults are involved in the design process, these are often superficial interactions mainly applied in an evaluation phase when possible changes or influence on the design process is minimal. Finally, there is often bias towards including older adults who are relatively young, independent, and from higher socio-economical class (see also Chapter 3).

Participatory design, co-design, and co-creation methods are increasingly gaining attention as preferred ways of involving the end-users in the design process. ‘The ultimate partnership’, as participants in one of our studies referred to (Mannheim et al., 2020), should be involving older adults from the very initial stages of the design, before the advanced stages where few changes are made. We have found that older adults are highly motivated to participate and contribute. More importantly, they bring vast experience to the design process, which is both professional and life experience of people who have seen and experienced numerous technological developments throughout their lifetime. Older adults are also much more likely to understand the needs of their age group. However, in order for design to be inclusive, there is a need to involve a diverse group of older adults, and also involve those relevant to the DT being developed (e.g. a falls prevention app should be developed with older adults at risk for falling, and not just any person above the age of 65).

Implications for research and policy

Further inquiry and empirical research are needed to fully understand the role of ageism in the use and design of DT. In this chapter, we mainly focused on the stereotypical and prejudicial aspects of ageism. However, further examination of the discrimination aspect of ageism in the use of DT in healthcare and of other stakeholders such as designers and policymakers is needed. As indicated, implicit and self-directed ageism (Levy and Banaji, 2002) is a strong mechanism and often happens without awareness from the person. Investigating older adults’ own attitudes can provide important insights on ageism as a potential barrier to DT use,

which could lead to campaigns and interventions dealing with self-ageism and aiming for empowerment and age-friendly societies. Nevertheless, communication between healthcare professionals, designers, and older adults is often characterised by indirect expressions of ageism such as patronising speech (Abrams et al., 2011), ‘elder talk’ (Nussbaum et al., 2005), or other non-verbal communications (Ambady et al., 2002). This, in turn, might also trigger self-ageism. Therefore, it is also important to observe the reciprocal nature of the interaction between older adults and others in order to realise the manifestations of DT-related ageism. More research is also needed in order to broaden the understanding of gender differences that occur in self-perceptions of age-related DT ability and influences of intergenerational contact. Finally, it could be useful to quantitatively examine ageism in relation to other well-known determinants of acceptance, namely ease of use and perceived benefit.

Policy and law can play an important role in combating ageism (Officer and de la Fuente-Núñez, 2018; WHO, 2021). This can be done by ensuring that heterogeneous groups of people of all ages are included in the design process. Policy should aim for age-inclusiveness in both research and the media. Finally, there needs to be a change from the fixation of DT finding solutions, mainly for healthcare issues, to a broader array of DTs that reflect the actual needs and wants of older adults and strive for inclusion of older adults in the way DTs are designed and used.

Notes

- 1 <https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>
- 2 Euroageism is a multidisciplinary research network, with a focus on innovative aspects of research on ageism and with the goal of promoting evidence-based policy in the field. For more information on the activity and publications of the ‘Euroageism’ ITN, see <https://euroageism.eu/>.

References

- Abrams, D., Russell, P.S., Vauclair, M., et al. (2011) *Ageism in Europe: Findings from the European Social Survey*. Technical report. AgeUK.
- Alemayehu, B. and Warner, K.E. (2004) ‘The lifetime distribution of health care costs’, *Health Services Research*, 39(3), pp. 627–642. <https://doi.org/10.1111/j.1475-6773.2004.00248.x>
- Allen, L.D. and Ayalon, L. (2020) “‘It’s pure panic’”: the portrayal of residential care in American Newspapers during COVID-19’, *The Gerontologist*, 61(1), pp. 86–97. <https://doi.org/10.1093/geront/gnaa162>
- Ambady, N., Koo, J., Rosenthal, R., et al. (2002) ‘Physical therapists’ nonverbal communication predicts geriatric patients’ health outcomes’, *Psychology and Aging*, 17(3), p. 443. <https://doi.org/10.1037/0882-7974.17.3.443>
- Astell, A. (2013) ‘Technology and fun for a happy old age’ In Sixsmith, A. and Gutman, G (Eds) *Technologies for Active Aging*. New York: Springer, pp. 169–187. https://doi.org/10.1007/978-1-4419-8348-0_10

- Ayalon, L. (2014) 'Perceived age, gender, and racial/ethnic discrimination in Europe: Results from the European social survey', *Educational Gerontology*, 40(7), pp. 499–517. <https://doi.org/10.1080/03601277.2013.845490>
- Ayalon, L. and Tesch-Römer, C. (2018) *Contemporary Perspectives on Ageism*. Cham: Springer Nature. <https://doi.org/10.1007/978-3-319-73820-8>
- Ayalon, L., Dolberg, P., Mikulionienė, S., et al. (2019) A systematic review of existing ageism scales. *Ageing Research Reviews*, 54, 100919. <https://doi.org/10.1016/j.arr.2019.100919>
- Bargh, J.A. (1994) 'The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition', In Wyer, R.S. and Srull, T.K. (eds.) *Handbook of Social Cognition*. Hillsdale, NJ: Erlbaum pp. 1–40.
- Ben-David, B.M., Malkin, G. and Erel, H. (2018) 'Ageism and neuropsychological tests' in Ayalon L. and Tesch-Römer C. (Eds.) *Contemporary Perspectives on Ageism*. Cham: Springer, pp. 277–297. https://doi.org/10.1007/978-3-319-73820-8_17
- Burnes, D., Sheppard, C., Henderson Jr, C.R., et al. (2019) 'Interventions to reduce ageism against older adults: A systematic review and meta-analysis', *American Journal of Public Health*, 109(8), pp. 1–9. <https://doi.org/10.2105/AJPH.2019.305123>
- Cary, L.A., Chasteen, A.L. and Remedios, J. (2017) 'The ambivalent ageism scale: Developing and validating a scale to measure benevolent and hostile ageism', *The Gerontologist*, 57(2), pp. 27–36. <https://doi.org/10.1093/geront/gnw118>
- Choi, E.Y., Kim, Y., Chipalo, E., et al. (2020) 'Does perceived ageism widen the digital divide? And does it vary by gender?', *The Gerontologist*, 60(7), pp. 1213–1223. <https://doi.org/10.1093/geront/gnaa066>
- Chonody, J.M. (2015) 'Addressing ageism in students: A systematic review of the pedagogical intervention literature', *Educational Gerontology*, 41(12), pp. 859–887. <https://doi.org/10.1080/03601277.2015.1059139>
- Corrigan, P.W., Morris, S.B., Michaels, P.J., et al. (2012) 'Challenging the public stigma of mental illness: A meta-analysis of outcome studies', *Psychiatric Services*, 63(10), pp. 963–973. <https://doi.org/10.1176/appi.ps.201100529>
- Cuddy, A.J., Norton, M.I. and Fiske, S.T. (2005) 'This old stereotype: The pervasiveness and persistence of the elderly stereotype', *Journal of Social Issues*, 61(2), pp. 267–285. <https://doi.org/10.1111/j.1540-4560.2005.00405.x>
- Cutler, S. (2005) 'Ageism and technology', *Generations*, 29(3), pp. 67–72.
- Czaja, S.J. (2017) 'The potential role of technology in supporting older adults', *Public Policy & Aging Report*, 27(2), pp. 44–48. <https://doi.org/10.1093/ppar/prx006>
- Czaja, S.J., Charness, N., Fisk, A.D., et al. (2006) 'Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE)', *Psychology and Aging*, 21(2), p. 333. <https://doi.org/10.1037/0882-7974.21.2.333>
- Czaja, S.J., Beach, S., Charness, N., et al. (2013) 'Older adults and the adoption of healthcare technology: Opportunities and challenges' in Sixsmith, A. and Gutman, G. (eds) *Technologies for Active Aging*. New York: Springer, pp. 27–46. https://doi.org/10.1007/978-1-4419-8348-0_3
- Essén, A. and Östlund, B. (2011) 'Laggards as innovators? Old users as designers of new services & service systems', *International Journal of Design*, 5(3), pp. 89–98.
- Etkin, K. (2021) *2021 Age Tech Market Map*. Available at: <https://www.thegerontechhnologist.com/>. (Accessed 10 May 2021).
- Fraboni, M., Saltstone, R. and Hughes, S. (1990) 'The Fraboni Scale of Ageism (FSA): An attempt at a more precise measure of ageism', *Canadian Journal on Aging/La revue*

- canadienne du vieillissement*, 9(1), pp. 56–66. <https://doi.org/10.1017/S0714980800016093>
- Gawronski, B., Deutsch, R., Mbirkou, S., et al. (2008) ‘When “just say no” is not enough: Affirmation versus negation training and the reduction of automatic stereotype activation’, *Journal of Experimental Social Psychology*, 44(2), pp. 370–377. <https://doi.org/10.1016/j.jesp.2006.12.004>
- Gewirtz-Meydan, A. and Ayalon, L. (2017) ‘Physicians' response to sexual dysfunction presented by a younger vs. An older adult’, *International Journal of Geriatric Psychiatry*, 32(1), pp.1476–1483. <https://doi.org/10.1002/gps.4638>
- Greenhalgh, T., Wherton, J., Sugarhoad, P., et al. (2013) ‘What matters to older people with assisted living needs? A phenomenological analysis of the use and non-use of telehealth and telecare’, *Social Science & Medicine*, 93, pp. 86–94. <https://doi.org/10.1016/j.socscimed.2013.05.036>
- Greenhalgh, T., Wherton, J., Papoutsi, C., et al. (2017) ‘Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies’, *Journal of Medical Internet Research*, 19(11), e367. <https://doi.org/10.2196/jmir.8775>
- Gustafson Jr, D.H., Maus, A., Judkins, J., et al. (2016) ‘Using the NIATx model to implement user-centered design of technology for older adults’. *JMIR Human Factors*, 3(1), e2. <https://doi.org/10.2196/humanfactors.4853>
- Hakobyan, L., Lumsden, J. and O'Sullivan, D. (2015) ‘Participatory design: How to engage older adults in participatory design activities’, *International Journal of Mobile Human Computer Interaction (IJMHCI)* 7(3), pp. 78–92. <https://doi.org/10.4018/ijmhci.2015070106>
- Heerink, M., Kröse, B., Evers, V., et al. (2010) ‘Assessing acceptance of assistive social agent technology by older adults: The almere model’, *International Journal of Social Robotics*, 2(4), pp. 361–375. <https://doi.org/10.1007/s12369-010-0068-5>
- Hong, Y., Goldberg, D., Dahlke, D.V., et al. (2014) ‘Testing usability and acceptability of a web application to promote physical activity (iCanFit) among older adults’, *JMIR Human Factors*, 1(1), e2. <https://doi.org/10.2196/humanfactors.3787>
- Howes, S.C., Charles, D., Pedlow, K., et al. (2019) ‘User-centred design of an active computer gaming system for strength and balance exercises for older adults’, *Journal of Enabling Technologies*, 13(2), pp. 101–111. <https://doi.org/10.1108/JET-12-2018-0057>
- Iversen, T.N., Larsen, L. and Solem, P.E. (2009) ‘A conceptual analysis of ageism’, *Nordic Psychology*, 61(3), pp. 4–22. <https://doi.org/10.1027/1901-2276.61.3.4>
- Jones, S., Howard, L. and Thornicroft, G. (2008) ‘“Diagnostic overshadowing”: Worse physical health care for people with mental illness’, *Acta Psychiatrica Scandinavia*, 118, pp. 169–171. <https://doi.org/10.1111/j.1600-0447.2008.01211.x>
- Kornadt, A.E. and Rothermund, K. (2011) ‘Contexts of aging: Assessing evaluative age stereotypes in different life domains’, *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 66(5), pp. 547–556. <https://doi.org/10.1093/geronb/gbr036>
- Köttl, H., Cohn-Schwartz, E. and Ayalon, L. (2020) ‘Self-perceptions of aging and everyday ICT engagement: A test of reciprocal associations’, *The Journals of Gerontology: Series B*, 1–10. <https://doi.org/10.1093/geronb/gbaa168>
- Köttl, H., Gallistl, V., Rohner, R., et al. (n.d.) (in progress) ‘But at the age of 85? Forget it!’ in *Internalized Ageism: A Barrier to Everyday ICT*.

- Kydd, A., Touhy, T., Newman, D., et al. (2014) 'Attitudes towards caring for older people in Scotland, Sweden and the United States', *Nursing Older People*, 26(2), pp. 33–40.
- Langer-Most, O. and Langer, N. (2010) 'Aging and sexuality: How much do gynecologists know and care?', *Journal of Women & Aging*, 22(3), pp. 283–289. <https://doi.org/10.1080/08952841.2010.518882>
- Lee, C. and Coughlin, J.F. (2015) 'PERSPECTIVE: Older adults' adoption of technology: An integrated approach to identifying determinants and barriers', *Journal of Product Innovation Management*, 32(5), pp. 747–759. <https://doi.org/10.1111/jpim.12176>
- Levy, B.R. (2009) 'Stereotype embodiment: A psychosocial approach to aging', *Current Directions in Psychological Science*, 18(6), pp. 332–336. <https://doi.org/10.1111/j.1467-8721.2009.01662.x>
- Levy, B.R. and Banaji, M.R. (2002) 'Implicit ageism', in Nelson T.D. (ed) *Ageism: Stereotyping and Prejudice Against Older Persons*. Cambridge, MA: The MIT Press, pp. 49–75.
- Levy, B.R., Slade, M.D., Kunkel, S.R., et al. (2002) 'Longevity increased by positive self-perceptions of aging', *Journal of Personality and Social Psychology*, 83(2), p. 261. <https://doi.org/10.1037/0022-3514.83.2.261>
- Linden, M. and Kurtz, G. (2009) 'A randomised controlled experimental study on the influence of patient age on medical decisions in respect to the diagnosis and treatment of depression in the elderly', *Current Gerontology and Geriatrics Research*, 2009, 475958. <https://doi.org/10.1155/2009/475958>
- Loos, E. and Ivan, L. (2018) 'Visual ageism in the media' in Ayalon, L. and Tesch-Römer, C. (Eds.) *Contemporary Perspectives on Ageism*. Springer, Cham, 163–176. https://doi.org/10.1007/978-3-319-73820-8_11
- Luijckx, K., Peek, S.T. and Wouters E. (2015) "'Grandma, you should do it: It's cool' older adults and the role of family members in their acceptance of technology", *International Journal of Environmental Research and Public Health*, 12(12), pp. 15470–15485. <https://doi.org/10.3390/ijerph121214999>
- Mannheim, I., Schwartz, E., Xi, W., et al. (2019) 'Inclusion of older adults in the research and design of digital technology', *International Journal of Environmental Research and Public Health*, 16(19), 3718. <https://doi.org/10.3390/ijerph16193718>
- Mannheim, I., Weiss, D., van Zaaen, Y., et al. (2020) "'Why is that robot following me?' Older participants' perspectives of co-designing digital technology", *Gerontechnology*, 19(0), 1–1. <https://doi.org/10.4017/gt.2020.19.s.69734.2>
- Mannheim, I., Wouters, E., van Boekel, L., et al. (2021) 'Attitudes of healthcare professionals towards older adults' abilities to use digital technology', *Journal of Medical Internet Research*, 23(4), e26232. <https://doi.org/10.2196/26232>
- Mannheim, I., Wouters, E., Köttl, H., et al. (n.d.) (in progress) Ageism as a latent variable in the design of digital technology: A scoping review.
- McDonough, C. (2016) 'The effect of ageism on the digital divide among older adults', *Journal of Gerontology and Geriatric Medicine*, 2(008), 1–7. <https://doi.org/10.24966/JGM-8662/100008>
- Mitzner, T.L., Boron, J.B., Fausset, C.B., et al. (2010) 'Older adults talk technology: Technology usage and attitudes', *Computers in Human Behavior*, 26(6), pp. 1710–1721. <https://doi.org/10.1016/j.chb.2010.06.020>
- Mynatt, E.D. and Rogers, W.A. (2001) 'Developing technology to support the functional independence of older adults', *Ageing International*, 27(1), pp. 24–41. <https://doi.org/10.1007/s12126-001-1014-5>

- Nelson-Kakulla, B. (2020) *2020 Tech Trends of the 50+*. Washington, DC: AARP Research. <https://doi.org/10.26419/res.00329.008>
- Neven, L. (2010) “‘But Obviously not for Me’: Robots, Laboratories and the Defiant Identity of Elder Test Users”, *Sociology of Health & Illness*, 32(2), pp. 335–347. <https://doi.org/10.1111/j.1467-9566.2009.01218.x>
- Neves, B.B. and Amaro, F. (2012) Too old for technology? How the elderly of Lisbon use and perceive ICT. *The Journal of Community Informatics*, 8(1), 1–12. <https://doi.org/10.15353/joci.v8i1.3061>
- Neves, B.B. and Vetere, F. (2019) ‘Ageing and emerging digital technologies’ in Neves, B.B. and Vetere, F. (eds.) *Ageing and Digital Technology*. Singapore: Springer, pp. 1–14. https://doi.org/10.1007/978-981-13-3693-5_1
- Ng, R., Allore, H.G., Trentalange, M., Monin, J.K., and Levy, B.R. (2015) ‘Increasing negativity of age stereotypes across 200 years: Evidence from a database of 400 million words’, *PLoS one*, 10(2), e0117086. <https://doi.org/10.1371/journal.pone.0117086>
- Nimrod, G. (2018) ‘Technophobia among older Internet users’, *Educational Gerontology*, 44(2–3), pp. 148–162. <https://doi.org/10.1080/03601277.2018.1428145>
- Nussbaum, J.F., Pitts, M.J., Huber, F.N., et al. (2005) ‘Ageism and ageist language across the life span: Intimate relationships and non-intimate interactions’, *Journal of Social Issues*, 61(2), pp. 287–305. <https://doi.org/10.1111/j.1540-4560.2005.00406.x>
- Officer A. and de la Fuente-Núñez V (2018) ‘A global campaign to combat ageism’, *Bulletin of the World Health Organization*, 96(4), p. 295. <https://doi.org/10.2471/BLT.17.202424>
- Palmore, E. (1999) *Ageism: Negative and Positive*: Springer Publishing Company.
- Peek, S.T., Wouters, E., Van Hoof, J., et al. (2014) ‘Factors influencing acceptance of technology for aging in place: A systematic review’, *International Journal of Medical Informatics*, 83(4), pp. 235–248. <https://doi.org/10.1016/j.ijmedinf.2014.01.004>
- Peek, S.T., Aarts, S. and Wouters, E. (2015) ‘Can smart home technology deliver on the promise of independent living? A critical re-flection based on the perspectives of older adults’ in van Hoof J., Demiris G. and Wouters, E.J.M. (eds.) *Handbook of Smart Homes, Health Care and Well-Being*. Cham: Springer, pp. 37–49. https://doi.org/10.1007/978-3-319-01904-8_41-2
- Peek, S.T., Luijckx, K., Vrijhoef, H., et al. (2019) ‘Understanding changes and stability in the long-term use of technologies by seniors who are aging in place: A dynamical framework’, *BMC Geriatrics*, 19(1), pp. 1–13. <https://doi.org/10.1186/s12877-019-1241-9>
- Peine, A. and Neven, L. (2019) ‘From intervention to co-constitution: New directions in theorizing about aging and technology’, *The Gerontologist*, 59(1), pp. 15–21. <https://doi.org/10.1093/geront/gny050>
- Peine, A. and Neven, L. (2020) ‘The co-constitution of ageing and technology: A model and agenda’, *Ageing & Society*, pp. 1–22. <https://doi.org/10.1017/S0144686X20000641> <https://www.cambridge.org/core/journals/ageing-and-society/article/coconstitution-of-ageing-and-technology-a-model-and-agenda/0778C39BAE292B6EB409E91B04440124>.
- Perdue, C.W. and Gurtman, M.B. (1990) ‘Evidence for the automaticity of ageism’, *Journal of Experimental Social Psychology*, 26(3), pp. 199–216. [https://doi.org/10.1016/0022-1031\(90\)90035-K](https://doi.org/10.1016/0022-1031(90)90035-K)
- Peters, K.R. and Gawronski, B. (2011) ‘Are we puppets on a string? Comparing the impact of contingency and validity on implicit and explicit evaluations’, *Personality and Social Psychology Bulletin*, 37(4), pp. 557–569. <https://doi.org/10.1177/0146167211400423>

- Previtali, F., Allen, L.D. and Varlamova, M. (2020) 'Not only virus spread: The diffusion of ageism during the outbreak of COVID-19', *Journal of Aging & Social Policy*, 32(4–5), pp. 1–9. <https://doi.org/10.1080/08959420.2020.1772002>
- Quan-Haase, A., Williams, C., Kicevski, M., et al. (2018) 'Dividing the grey divide: Deconstructing myths about older adults' online activities, skills, and attitudes', *American Behavioral Scientist*, 62(9), pp. 1207–1228. <https://doi.org/10.1177/0002764218777572>
- Reiners, F., Sturm, J., Bouw, L.J., et al. (2019) 'Sociodemographic factors influencing the use of eHealth in people with chronic diseases', *International Journal of Environmental Research and Public Health*, 16(4), p. 645. <https://doi.org/10.3390/ijerph16040645>
- Rosales, A. and Fernández-Ardèvol, M. (2020) 'Ageism in the era of digital platforms', *Convergence*, 26(5–6), pp. 1074–1087. <https://doi.org/10.1177/1354856520930905>
- Schulz, R., Wahl, H.W., Matthews, J.T. et al. (2015) 'Advancing the aging and technology agenda in gerontology', *The Gerontologist*, 55(5), pp. 724–734. <https://doi.org/10.1093/geront/gnu071>
- Shiovitz-Ezra, S., Shemesh, J. and McDonnell, M. (2018) 'Pathways from ageism to loneliness' in Ayalon L. and Tesch-Römer C. (eds.) *Contemporary Perspectives on Ageism*. Cham: Springer, pp. 131–147. https://doi.org/10.1007/978-3-319-73820-8_9
- Sixsmith, A. (2013) 'Technology and the challenge of aging' in Sixsmith, A and Gutman, G. (eds.) *Technologies for Active Aging*. Boston, MA: Springer, pp. 7–25. https://doi.org/10.1007/978-1-4419-8348-0_2
- Swift, H.J., Abrams, D., Lamont, R.A., et al. (2017) 'The risks of ageism model: How ageism and negative attitudes toward age can be a barrier to active aging', *Social Issues and Policy Review*, 11(1), pp. 195–231. <https://doi.org/10.1111/sipr.12031>
- Thornicroft, G., Rose, D. and Kassam, A. (2007) 'Discrimination in health care against people with mental illness', *International Review of Psychiatry*, 19(2), pp. 113–122. <https://doi.org/10.1080/09540260701278937>
- Tornstam, L. (2006) 'The complexity of ageism. A proposed typology', *International Journal of Ageing and Later Life*, 1(1), pp. 43–68. <https://doi.org/10.3384/ijal.1652-8670.061143>
- Uncapher, H. and Areán, P.A. (2000) 'Physicians are less willing to treat suicidal ideation in older patients', *Journal of the American Geriatrics Society*, 48(2), pp. 188–192. <https://doi.org/10.1111/j.1532-5415.2000.tb03910.x>
- van Boekel, L.C., Peek, S.T. and Luijkx, K.G. (2017) 'Diversity in older adults' use of the internet: Identifying subgroups through latent class analysis', *Journal of Medical Internet Research*, 19(5), e180. <https://doi.org/10.2196/jmir.6853>
- van Boekel, L.C., Wouters, E.J., Grimberg, B.M., et al. (2019) 'Perspectives of stakeholders on technology use in the care of community-living older adults with dementia: A systematic literature review', *Healthcare*, 7(2), p. 73. <https://doi.org/10.3390/healthcare7020073>
- Venkatesh, V., Morris, M.G., Davis, G.B., et al. (2003) 'User acceptance of information technology: Toward a unified view', *MIS Quarterly*, 23(3), pp. 425–478. <https://doi.org/10.2307/30036540>
- Wanka, A. and Gallistl, V. (2018) 'Doing age in a digitized world: A material praxeology of aging with technology', *Frontiers in Sociology*, 3, p. 6. <https://doi.org/10.3389/fsoc.2018.00006>
- World Health Organization. (2021) *Global Report on Ageism*. Geneva: World Health Organization.

- Wu, Y.H., Damnée, S., Kerhervé, H., et al. (2015) 'Bridging the digital divide in older adults: A study from an initiative to inform older adults about new technologies', *Clinical Interventions in Aging*, 10, pp. 193–201. <https://doi.org/10.2147/CIA.S72399>
- Wurm, S. and Benyamini, Y. (2014) 'Optimism buffers the detrimental effect of negative self-perceptions of ageing on physical and mental health', *Psychology & Health*, 29(7), pp. 832–848. <https://doi.org/10.1080/08870446.2014.891737>
- Wyman, M.F., Shiovitz-Ezra, S. and Bengel, J. (2018) 'Ageism in the health care system: Providers, patients, and systems' in Ayalon, L. and Tesch-Römer, C. (eds.) *Contemporary Perspectives on Ageism*. Cham: Springer, pp. 193–212. https://doi.org/10.1007/978-3-319-73820-8_13
- Xi, W., Zhang, X. and Ayalon, L. (n.d.) (in progress) 'Contrast vs. Contact: How Framing of Intergenerational Comparison in the Advertisement of Technology Influences Technophobia Among Older Adults', *Journal of Gerontological Psychology Science*.