Technological Change and Older Workers

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Abstract

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This study investigates the influence of age on perceived technological competence and interpersonal skills in the workplace. We aimed to challenge common age-related stereotypes and explore the potential effects of individual variability within the older adult population. Using an online experiment and survey method, we examined participants' assessments of a younger versus older hypothetical worker's technological competence. Our findings revealed no significant difference between the perceived technological competence of older and younger workers, suggesting that age stereotypes may be less prevalent than typically assumed. Contrary to previous research, our data indicated that older participants did not hold negative attitudes towards their in-group members. The study further showed that age did not significantly influence self-reported technological learning satisfaction or self-efficacy about learning technology. Our research highlights the importance of addressing age-related stereotypes to foster a diverse and inclusive workforce. Furthermore, it emphasizes the necessity of creating an environment that supports and encourages employees of all ages to learn and adapt to new technologies, considering the increasingly multigenerational nature of workplaces. The study's findings have significant implications for organizational practices and policies, particularly concerning age diversity and technology-related competency. However, limitations related to sample representation and geographical constraints suggest a need for further research to extend and validate these findings.

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Introduction

In a recent opinion piece in the New York Times, Dr. Howard J. Tucker declared that despite being 100 years old, he is not too old to work. Dr. Tucker is a neurology physician and lawyer from Cleveland. He addresses the concerns raised by many about the mental capacity and competency of older workers, referencing a recent Columbia University study. The study, titled "Estimating the Prevalence of Dementia and Mild Cognitive Impairment in the US: The 2016 Health and Retirement Study Harmonized Cognitive Assessment Protocol Project" and published in the journal JAMA Neurology on October 24, 2022, found that rates of dementia and mild cognitive impairment among people aged 65 to 69 were 3% and 22%, respectively. However, rates increased for those aged 90 and above to a prevalence of 35%. Dr. Tucker points out that the majority of adults aged 65 and over are unaffected by cognitive decline and many of them are willing to continue working well into their golden years.

The workforce is aging, and the governments of the Organization for Economic Cooperation and Development (OECD) are searching for ways to engage and retain older workers for as long as possible (OECD, 2019; Gaillard & Desmette, 2010). Offering flexibility (Eisenberg, 2022), learning opportunities (Gaillard & Desmette, 2010), and extra support to transition to new roles and technologies (Van Selm & Van der Heijden 2013; MacDermott, 2016) can encourage older workers to reconsider and postpone retirement. However, there are pervasive stereotypes about older or "mature" workers in the workplace that suggest they are less productive, less adaptable to new technology, less willing to learn new skills, more resistant to change, more prone to health problems, unmotivated, and more likely to retire soon (Kroon, Van Selm, Ter Hoeven & Vliegenthart, 2018; Fisher, Truxillo, Finkelstein, & Wallace, 2017;

Posthuma & Guerrero, 2013; Van Dalen, Henkens, & Schippers, 2010; Cuddy, Norton, & Fiske, 2005; Henkens, 2005; Fiske, Cuddy, Glick, & Xu, 2002; Chiu, Chan, Snape & Redman, 2001). As a result, older workers are more likely to experience age discrimination (Drydakis, MacDonald, Chiotis, & Somers, 2018; Neumark, Burn, & Button, 2019; Rabl, 2010; Imel, 1996), and are faced with high potential of social exclusion (Van Dalen, Henkens, & Schippers, 2009), which can make it difficult to find and keep jobs (Wanberg, Kanfer, Hamann, & Zhang (2016) and negatively impact their sense of self-worth (Von Hippell et al., 2011). Although these stereotypes are not always accurate, people still rely on stereotypes to quickly and efficiently process the large amount of information they encounter on a daily basis. Information pertaining to older individuals may be remembered selectively to fit preconceived stereotypes (Levy, 1996). Limited, incomplete knowledge is used to generalize people based on their membership in a particular group, resulting in inappropriate attributions. Moreover, age related stereotypes vary depending on the context and are not triggered in all circumstances (Allen, Sherman, Conrey, & Stroessner, 2009). When it comes to learning technology, for example, age related stereotypes are more likely to be triggered (Ng & Feldman, 2012; Kroon et al., 2018). Older workers may be just as productive, adaptable, and willing to learn new skills as younger workers (Lee, Czaja & Sharit, 2009; Vaportzis, Giatsi Clausen, & Gow, 2017), and they bring a wealth of experience and knowledge to the workplace that can be valuable to any organization (Van Dalen et al., 2009; Brooke, 1986). As evidenced by programs, such as “Age-Friendly Workplaces” designations, there are employers that recognize the value of wisdom capital and re-evaluate their views about older workers (Eisenberg, 2022; Sonnet, Olsen, & Manfredi, 2014).

Over the years, extensive research on age-related stereotypes has contributed to the growing consensus that ageism can be more accurately understood as a context-dependent

phenomenon, i.e., stereotypes' valence vary depending on the context and may not be present in all situations (Steele, 1997; Landy, 2008; Von Hippel, Issa, Ma, & Stokes, 2011; Cebola, Dos Santos, & Dionísio, 2021; Murphy, & DeNisi, 2022). This perspective emphasizes the importance of context in shaping ageist attitudes and behaviors. In light of the significant demographic shift towards an older workforce, together with recent changes in government policies that promote later eligibility for full retirement benefits, and the increasing reliance on technology to modernize operations, it becomes essential to investigate the perceptions of older employees' performance. This research aims to examine how age may influence perceptions of employees' performance when working with new technologies, using a controlled experimental design to explore the potential impact of an employee's age on these perceptions. Our study will concentrate on the key variables such as the employee's age, their perceived technological competency, perceived interpersonal skills, their perceived satisfaction with technology learning, and self-efficacy about learning technology.

Technological Change and Ageism at Work

The modern workforce is undergoing significant vicissitudes along two dimensions: technology and aging. With the rapid advancement of technology, many traditional jobs are being replaced by automated systems and artificial intelligence. This trend has led to a growing demand for workers with technological expertise and the ability to adapt to new systems. At the same time, the workforce is also experiencing a significant shift towards an older demographic as people are living longer and choosing to continue working later in life, as demonstrated in the opening story about a 100-year-old practicing doctor. As the workforce continues to evolve

along these two dimensions, age-related stereotypes become more prevalent (see Cebola et al., 2021).

The need for workers to adapt to new technologies, such as telecommuting and remote work, is on the rise. Recruiters are aware of the workforce's demand for flexible and remote work opportunities, and organizations that offer these benefits have an advantage over those that do not (Eisenberg, 2022). For example, telecommuting, which is the use of telecommunications technology to work from home during regular work hours instead of commuting to a conventional workplace (Mokhtarian & Salomon, 1994), has become increasingly popular. Human-resource managers are seeking competent employees who can successfully work remotely, and they are also investing in training and retraining existing employees to use ever-evolving technologies.

In the early 2020s, the COVID-19 pandemic, along with the associated lockdowns, acted as a significant catalyst for the acceleration of the shift towards telecommuting, as well as a general increase in and heavy reliance on technology (Parent-Lamarche, 2022). Many businesses were forced to shut down or limit their operations due to social distancing measures and lockdowns, making telecommuting a crucial lifeline for numerous workers. The shift towards telecommuting during the pandemic underscored the need for workers to rapidly adapt to new technologies and work environments, which necessitated a high degree of adaptability and flexibility, both of which are critical skills for workers in the modern economy. It goes without saying that companies require employees with such skills. In the context of the COVID-19 pandemic, the ability to work remotely and use technology effectively was a critical factor between business continuity and failure. As such, it is no surprise that companies now place a greater emphasis on recruiting and training workers with these essential skills. The rapid

advancement of technology in the workplace has created an unprecedented demand for personnel development and training, which is crucial for maintaining a competitive edge in today's business landscape (Marr, 2022).

Personnel development and training increasingly concerns older individuals. In many developed countries, both the population and workforce are rapidly aging, leading to significant declines in labor-force participation rates (Tur-Sinai et al., 2022; Ghosh, 2021; Maurer, Barbeite, Weiss, & Lippstreu, 2008). Recent economic and social development research indicates that more than one in five working-age Canadians are nearing retirement age, exacerbating the challenges faced by organizations already grappling with the "great resignation," the rise of the "gig economy," and the increasing emphasis on remote/flexible work and technology in daily operations (Marr, 2022). As a result, labor shortages and shifts in the age composition of the workforce are increasingly influencing the labor market. According to the World Health Organization (WHO, 2022), the number of people aged 60 years or older is expected to increase by 34% in the next decade, from 1 billion in 2019 to 1.4 billion by 2030. This means that by 2030, approximately one in six people in the world will be 60 years or older. Furthermore, between 2015 and 2050, the proportion of the world's population over 60 years will double from 12% to 22%. As the population continues to age, older people are staying in the workforce for longer periods of time. This trend has prompted many OECD countries to re-evaluate their retirement policies, particularly the age at which individuals can access government-supported retirement funds (Kulik, Ryan, Harper, & George, 2014; Van Dalen, Henkens, & Schippers, 2010). For instance, in the United Kingdom, the state pension age has increased from 60 for women and 65 for men to 67 for those born between 1960 and 1978, with a projected increase to 68 by 2037. Similarly, the full retirement age in the United States is gradually increasing from 65

to 67 for individuals born in or after 1960 by 2023. Australia is also incrementally raising the pension age from 65 to 67 years, with a projected increase to 70 by 2035 (Kulik et al., 2014). The new legislation in France made headlines this spring when French government raised the retirement age from 62 to 64, and to qualify for the pension, as of 2027, workers will be required 43 years of contribution to social security, rather than current 42 (Jiang, 2023). These changes highlight the persistent presence of and the need to accommodate a growing aging population in the workforce.

According to some scholars, the shift towards new technologies and remote work will pose a particular challenge for older workers. Research has been conducted for several decades on age-related stereotypes, which has shown that older adults are often perceived as unwilling or unable to adapt to technological changes and lacking in technological skills (Ng & Feldman, 2012; Van Dalen et al., 2009; Ryan, Szechtman & Bodkin, 1992; Rosen & Jerdee, 1976). The term age-ism was coined by Robert N. Butler in 1969 to refer to discrimination or prejudice towards individuals of different age groups. Stereotypes are considered to be the cognitive components of ageism, prejudice constitutes the emotional components, and discrimination manifests as the behavioral component, which includes denying job opportunities or promotions to older workers (Cuddy, Norton, & Fiske, 2005). Ageism is a challenging barrier to older workers' labor participation or continued participation, and it involves negative attitudes toward older workers, which can make it difficult for them to succeed or feel valued in their workplace. Ageist stereotypes can lead to decisions against hiring older adults who are actively seeking employment opportunities (Drydakis, MacDonald, Chiotis, & Somers, 2018), and those who are employed may be passed over for training opportunities. Despite the prohibition of age discrimination by the Charter of Human Rights and Freedoms in Quebec and similar laws in

other countries, such as the Age Discrimination in Employment Act (ADEA) of 1967 in the US, ageism remains a prevalent and is challenging to address.

Stereotypes are Shortcuts in Perception

Before delving into ageism as a stereotype, it is important to first discuss the nature of stereotypes briefly and how they can influence people's perceptions. According to Henkens (2005), individuals use their perceptions to effectively categorize and organize information. Category-based information processing occurs automatically, especially when information about an individual is limited, according to models of impression formation (Fiske, Lin, & Neuberg, 2018; Brewer & Harasty Feinstein, 1999). When new information is encountered, it is assigned to and stored in specific categories within memory corresponding to each category (Brewer, Dull, & Lui, 1981). Social information is processed by categorizing it based on a person's characteristics such as race, ethnicity, age, gender, religion, and social status. This categorized information is then used to group people based on their observed characteristics into various groups. Categorization is cognitively efficient, as it allows individuals to obtain maximum information about a group with minimal cognitive effort (Gilbert & Hixon, 1991). However, this categorization process has its drawbacks, as it often leads to overgeneralization and the formation of stereotypes (Finkelstein, Burke, and Raju, 1995; Van Dalen, Henkens, and Schippers, 2010). As a result, perceptions of similarity within a group are frequently overestimated, while differences among individuals and members of the group are typically underestimated.

In their work, Hilton and Von Hippel (1996) define stereotyping as the application of "beliefs about the characteristics, attributes, and behaviors of members of certain groups and

theories about how and why particular attributes go together". Stereotyping is viewed as a cognitive strategy that saves energy and allows for rapid acquisition of information. Individuals are more likely to use stereotypes when they are cognitively busy or when specific information about an individual is not readily available. However, when adequate information about an individual is available, stereotypes can be ignored (Murphy & DeNisi, 2022).

Stereotypes serve different functions in different contexts, such as simplifying processing demands, augmenting perception beyond given information, or justifying specific behaviors. Stereotypic thinking is "multiply mediated," meaning that categorizing and stereotyping people based on their memberships can accurately represent real differences between groups (Hilton & Von Hippel, 1996). However, stereotyping may miss individual differences and overemphasize group differences. Stereotypes based on inherent characteristics have a higher potential for error and may accentuate differences between groups rather than similarities. Therefore, any characteristic that decreases similarity between the individual and the stereotypic group dilutes the stereotype's power. One potential consequence of stereotypes is the application of unfair, negative attributes via generalization to members of stereotyped groups. As Allport (1954) stated, this is "antipathy based on a faulty and inflexible generalization" (p. 9).

Age-Related Stereotypes: Perceptions and Impact on Older Workers

Despite the existence of laws prohibiting age discrimination in many industrialized nations, age-based biases remain a prevalent and widespread occurrence in the workforce that can lead to discrimination against older employees (Van Dalen, Henkens, & Schippers, 2010; Fasbender & Wang, 2017). Negative perceptions surrounding older workers often involve their ability to adjust to new technologies (Henkens, 2005). One example of such a stereotype is the

belief that older people struggle with new technology and are less motivated to learn, which can affect their performance (Ng & Feldman, 2012). However, willingness to learn is a more critical factor in job performance than age (Mokrzan, 2016).

Stereotypes among different groups about older workers being less competent than younger workers have been documented. These groups include, among others, young adults and human resources professionals (Krings, Sczesny, & Kluge, 2011). In literature, we find several definitions of "competence", such as capable, skillful, and intelligent (Krings et al., 2011). Some researchers analyze competence together with "warmth," which are the two fundamental dimensions of social judgment and stereotype content theories, as mentioned by Fiske et al. (2002), Krings et al. (2011), and Marcus, Fritzsche, Le, & Reeves (2016). A more refined definition of “warmth” includes the following attributes: good-natured, tolerant, sincere, well-intentioned, trustworthy, which can be characterized as prosocial traits (Fiske et al., 2002). This assortment of diverse terms is typically categorized as interpersonal skills, personal attributes, or behavioral prosocial traits.

Various studies have explored the effects of age-related stereotypes on older workers, revealing both similarities and differences in the perceptions of older employees across different contexts (Rosen & Jerdee, 1976; Kirchner & Dunnette, 1954; Drehmer et al., 1992; Ng & Feldman, 2012; Henkens, 2005; Kroon et al., 2018; Mokrzan, 2016; Harris et al., 2017; Chiu et al., 2001). Commonalities across these studies include the perception that older workers are less interested in learning about new technology (Rosen & Jerdee, 1976; Henkens, 2005), less trainable than younger counterparts (Brooke & Taylor, 2005), less willing to participate in training activities (Ng & Feldman, 2012), and negatively associated with technological competence (Kroon et al., 2018). However, these studies also highlight the positive qualities

attributed to older workers, such as dependability, commitment, loyalty (Harris et al., 2017), and warmth (Kroon et al., 2018).

Differences in perceptions of older workers were evident in the context of the studies. For example, hourly production workers held more favorable attitudes towards older workers than supervisors (Kirchner & Dunnette, 1954), and the age of the participant influenced their beliefs about older workers' adaptability and work effectiveness (Chiu et al., 2001). Mokrzan (2016) found that when coworkers were unwilling to learn new technology, the 75-year-old coworker was attributed with more positive workplace performance than the 25-year-old coworker. Geographical differences were also observed, with negative stereotypes about older workers' ability and motivation being more prevalent in the UK compared to Hong Kong (Chiu et al., 2001). Interestingly, some studies found that chronological age did not play a significant role in performance evaluations (Drehmer et al., 1992) and that job performance was generally unrelated to the age of workers (Ng & Feldman, 2012).

In summary, the body of research on age-related stereotypes reveals a complex interplay of commonalities and differences in perceptions of older workers. These findings emphasize the importance of considering the context in shaping ageist attitudes and the need to challenge assumptions about older workers in order to foster a more inclusive and supportive workplace environment.

Despite efforts to promote sustainable employment for older workers, such as professional development and growth opportunities, these practices are not yet common (Van Selm & Van der Heijden, 2013; MacDermott, 2016). This is unfortunate because studies have demonstrated a positive relationship between age and certain job performance dimensions, such as organizational citizenship behaviors and safety behavior, and a negative relationship with

counterproductive work behaviors and absenteeism, while age has little or no association with core task performance and creativity (Ng & Feldman, 2008). This suggests that older workers' performance may actually be mildly superior to that of younger workers on specific aspects of work.

At the other end of the age spectrum, journalistic accounts call into question the ability of young employees, particularly new graduates, to adapt and learn when joining a new organization remotely during the pandemic (Blum, 2020). Older workers may be more resilient in this context. Millions of baby boomers are approaching the retirement age, and organizations are acutely aware. It appears that many North American companies, having faced rough times during the pandemic, re-evaluate their views about older workers, with notable trends towards "affirming the value of experienced workers", affording older workers the flexibility to choose when and how much they work (Eisenberg, 2022). Furthermore, some companies strive for "Age-Friendly Workplaces" designations, signaling recognition of mature workers' skills, perspectives, and abilities, with each worker having a unique wealth of experiences.

Older workers offer "organizational wisdom," a form of organizational capital that is generally under-used (Ferreira-Vasconcelos, 2018). One such use of "wisdom capital" could be in collaborations which draw on the collegiality, reliability, and loyalty perceived in older workers (Guillén & Kunze, 2019; Lee, Czaja & Sharit, 2009; Van Dalen et al., 2009).

Stereotype Threat and Self-Stereotypes

After discussing the existence of age-related stereotypes, it is important to explore the impact that these stereotypes can have on older adults. One way that age-related stereotypes can affect older adults is through stereotype threat. Stereotype threat is the phenomenon where

individuals who belong to a certain group may experience fear of confirming, being seen to confirm, or feeling pressure to conform to negative stereotypes targeting the social group to which one belongs (Steele & Aronson, 1995). Stereotype threat may lead individuals to disengage and avoid the stereotyped domain (Steele, 1997; Mariano et al., 2020), can lead to anxiety and decrease performance in situations where those negative stereotypes are salient (Lamont, Swift, & Abrams, 2015). People of all ages may experience age-related stereotype threat. In particular, old age stereotype threat can be triggered by subtle cues or reminders of the negative stereotypes, such as the presence of age-related information on a test or job application, and then this reminder can provoke an individual to begin to behave in ways that confirm those stereotypes. In the workplace, old age stereotype threat has been linked to negative workplace attitudes and behaviors, such as decreased job satisfaction, job engagement, and workplace wellbeing (Von Hippel, Kalokerinos, Haanterä, & Zacher, 2019; von Hippell et al., 2011), sufficient to undermine performance (Oliveira and Cabral-Cardoso, 2017). For instance, older adults who are savvy with FaceTime and WhatsApp may worry about using a wall calendar at work as it will confirm the stereotype that older employees avoid learning and using new technologies, and that they will be judged as less technically skilled as a result.

Another way that age-related stereotypes can affect older adults is through self-stereotyping. Stereotype-threat theorists do not employ this term. The concept of self-stereotyping refers to a situation of self-fulfilling prophecy, whereby individuals who belong to a certain social group tend to characterize themselves as possessing more stereotypical traits associated with their group, rather than non-stereotypical ones (Latrofa, Vaes, Pastore, & Cadinu, 2009). This happens in two stages. Firstly, an individual's age membership is imposed upon them, either formally or informally, rather than being accepted as valid by the target. This

process transforms the target individual from an outsider into a member of an in-group. Subsequently, the individual identifies with and “joins” the reference group. The length of time required to fully participate in the reference group depends on the degree to which an individual ascribes negativity to aging stereotypes. The more negative one's perception of aging stereotypes, the longer the reluctance to identify with the elderly group (Levy, 2003).

To elaborate, older adults who believe that they are forgetful or have a reduced cognitive capacity may inadvertently worsen their performance on memory tasks. This occurs because individuals internalize negative age stereotypes of their in-group into their own self-concept (Chiu, Hong, Lam, Fu, Tong, & Lee, 1998), and such internalization, in turn, can lead to anxiety, self-doubt, and stress, which can reduce cognitive resources and subsequently lead to poorer performance on cognitive tasks. As a result, self-stereotyping can become a vicious cycle that perpetuates negative age stereotypes and leads to worse outcomes for older adults.

Gaillard and Desmette (2010) conducted a study to investigate the impact of age-related stereotypes on Belgian older workers' attitudes toward work, including early retirement intentions and learning and development inclinations. They examined the effects of activating positive versus negative stereotypes on work aspirations. The findings revealed that negative stereotypes about older workers questioned their motivation and ability to work, learn, and develop, while positive age stereotypes, such as motivation and ability to work, learn, and develop, diminished retirement intentions. This resulted in older workers being "less willing to retire early" and having "more interest in learning and development" (p.94).

Similarly, Maurer, Barbeite, Weiss, and Lippstreu (2008) explored the effects of stereotypes about older adults on the behavior of older workers themselves. They found that the stereotype that older workers are unwilling and unable to learn and keep up can be a significant

impairment to the older workers themselves. The internalization and self-verification of these stereotypes can negatively affect self-efficacy and motivation to learn and develop. The study involved 134 participants who completed a two-wave survey, revealing that older workers' beliefs about their ability to learn were related to lower levels of interest in development activities, lower levels of self-efficacy for learning, and greater beliefs that they should retire.

Maurer, Weiss, and Barbeite (2003) conducted a 13-month longitudinal study with 800 participants, which showed that older workers received less support for learning activities. Personal factors such as anxiety, self-efficacy, and perceived benefits of participation affected individual participation in training and development activities. Those individuals who perceived themselves as capable of learning new skills were more likely to participate in training activities relative to those who perceived potential benefits from participation. In general, age was found to be negatively related to both individual and situational variables that foster participation in job development activities. Overall, these studies highlight the impact of age-related stereotypes on older workers' attitudes and behavior toward work and learning and development activities.

On the other hand, individuals also internalize positive age stereotypes (Levy, 2003) and perceive themselves and age-related changes favourably (Taneva *et al.*, 2016). Although concerned about their ability to acquire new skills, they appreciate their own ability to consider organizational problems broadly, and they feel that their accumulated experience allows to express themselves and focus their energies on things they do well. Older adults are willing and able to adapt to technological changes when they perceive potential benefits, have access to technical support and when technological innovations take their needs (e.g., ergonomics) into account (Czaja & Sharit, 2013).

Explicit and Implicit Age Attitudes

Research by Nosek, Banaji, & Greenwald (2002) showed that explicit beliefs seem to work independently of implicit beliefs. In examining individuals' beliefs about various social categories, including race, gender, and age, a mediocre correlation emerges between explicitly expressed beliefs and the unconscious attitudes individuals hold regarding age. Despite the prevalence of negative attitudes towards aging, these beliefs manifest even more negatively at the subconscious level. Intriguingly, older adults harbor negative views towards their own age group, akin to the negative perceptions that younger individuals exhibit towards the elderly (Nosek et al., 2002). This suggests that automatic attitudes and stereotypes, even those consciously rejected, remain uncontrollable. Implicit biases are not confined to particular social groups; they are evident across all age categories. Equally important, it is plausible that there exist no disparities in performance between older and younger workers, and in fact, older employees may outperform their younger counterparts. If this is the case, then the unfavorable attitudes expressed by employers should be attributed to subconscious bias and subliminal instances of age discrimination in the workplace (Malinen & Johnston, 2013).

However, these biases differ depending on group membership and cultural influences. While older adults tend to exhibit more positive explicit attitudes toward members of their own age group (Tajfel, 1981), they do not demonstrate a corresponding positive implicit in-group bias. Instead, their implicit attitudes reflect the impact of the broader culture's negative perceptions of these groups. Implicit attitudes, therefore, appear to divulge the profound effects of both the immediate environment and the wider cultural context on the formation and internalization of individual preferences and beliefs. Among older people, it seems, the well-

established social psychology concept of in-group bias, or preference, does not universally apply (Levy, 2003).

Power of information

As stated before, limited information may trigger social categorization processes (Fiske et al., 1999; Nicolas, Bai, & Fiske, 2022). When it comes to a work environment, however, workers' attitudes can significantly impact an individual's belief system. The use and selection of information to form perceptions and attitudes are largely dependent on individual differences (Zalesny & Ford, 1990).

The study by Derous & Decoster (2017) aimed to determine whether anonymous resume screening could be effective in reducing hiring discrimination. In their experimental study, which involved 610 HR professionals, the researchers manipulated the names and extracurricular activities of the applicants. The participants evaluated resumes that had either a young-sounding name and modern activities, an old-sounding name and modern activities, or an old-sounding name and old-fashioned activities. The results showed that the participants rated the resumes with a young-sounding name and modern activities as the most suitable for the job, followed by resumes with an old-sounding name and modern activities, and finally resumes with an old-sounding name and old-fashioned activities. These findings showed that recruiters use implicit cues in resumes to infer the age of the applicants. Employing implicit cues facilitated recruiters to categorize applicants into different social groups, which enhanced the category's salience, and thereby, recruiters were less able to avoid categorization (Fiske et al., 1999).

Relatedly, Murphy and DeNisi (2022) in their commentary argue that age stereotypes are not as prevalent as we commonly think, because organizational decisions are based on more

comprehensive information than just age. The commentary supports the notion that age stereotypes can be dispelled by organizationally relevant information that goes beyond age alone. Firstly, in large-scale studies of organizational decisions, there were no discernible adverse effects of stereotypes. Secondly, decision-makers in organizations are more likely to rely on individualizing information rather than stereotypes. Thirdly, age stereotypes are intricate and, therefore, not always likely to have uniformly negative effects. Finally, the studies attempting to demonstrate stereotype effects have limited generalizability and often exaggerate potential stereotype effects. When people are personally interacting and cooperating with the stereotyped members, this fosters individuation of the out-group members and relying less on stereotypes in judgements. More exposure with older people should give a closer-to-more appropriate representation of the individual differences. Individual information often dilutes stereotypes.

As more counter-stereotypical information is accumulated from multiple sources, it may eventually weaken or even negate the stereotype. Although stronger stereotypes and cognitive overload can lead to increased stereotyping, the impact of counter-stereotypical information may be even greater when the perceiver has a strong stereotype and is under cognitive overload (Allen, Sherman, Conrey, & Stroessner, 2009). Stereotypes are helpful for efficiently managing social information. However, their use depends on how deeply ingrained they are as conceptual structures (Levy, 2003) and how much cognitive capacity is available. Under different circumstances, a stereotype can act as a gatekeeper, self-perpetuating itself by directing attention toward expected information, or as an efficient information processing device that facilitates the extraction of novel information, potentially undermining itself (Allen et al., 2009).

The Present Study

The workforce is currently experiencing remarkable changes along the dimensions of technology and aging. Employers need employees to adapt to rapidly evolving technologies while the pool of available workers is not getting any younger. Consequently, technological competence becomes crucial for workers of all ages to secure and maintain employment, particularly for older workers. Prior research has shown that direct experience with older coworkers can either inform or reinforce existing stereotypes. Despite ongoing work contact with older colleagues, younger workers appeared to hold on to the inaccurate stereotypes about older workers being less productive than younger counterparts (Finkelstein et al., 1995). Hassell and Perrewe (1995) found that increased interaction with older colleagues can challenge and reduce negative beliefs, or at worst, confirm and solidify them. If negative stereotypes about older workers impact significant employment outcomes, older workers should experience worse outcomes compared to younger workers. However, existing evidence on typical workplace decisions does not support and even counter this assumption. Studies by Murphy and DeNisi (2022) emphasize the role of organizational context, while earlier findings indicate that age has little to no relationship with core task performance (Ng & Feldman, 2008; Czaja & Sharit, 1998; Drehmer et al., 1992).

Given the literature review above on the topic of age stereotypes, we question the persistent leitmotif of prevailing negative age stereotypes and their influence on people's judgments of others. Coupled with the limited existing research on the potential reduction or invalidation of negative age stereotypes when provided with individuating information, this paper aims to determine whether older employees are perceived differently when sufficient information is available about an individual, rendering age less prominent. Specifically, we

investigate whether negative stereotypes emerge when people estimate someone's age based solely on contextual information presented to them, rather than explicit age cues. This examination holds relevance in situations where age is not readily available or considered less relevant, such as recruitment, team formation, performance evaluation, and training.

Reflecting on the available research on conflicting implicit attitudes and explicitly reported beliefs about age (Nosek et al., 2002), we endeavour neither to frame a hypothetical employee as explicitly older or younger nor did we portray the worker as a middle-aged workforce participant. Instead, we employ a subtle hint to signal the relative age of the worker using a peripheral remark about the anniversary of their sibling. We anticipate that the questionnaire respondents will either consciously notice the sibling's age to infer the worker's age group or allow the unconscious link to reveal the implied age. In this regard, we propose the following research question:

R.Q. 1: Will others perceive a 50-year-old as less competent than a 25-year-old in managing technological change when age is not an emphasized or prominent factor?

Stereotypes can vary in terms of valence. Some positive age stereotypes depict older workers as good-humoured, knowledgeable, experienced, possessing a strong work ethic, and having superior social and interpersonal skills compared to their younger counterparts (Harris et al., 2017; Henkens, 2005). There is uncertainty about the influence of contextual details on individual attitudes and belief systems and whether individual differences apply to age stereotypes. Do older workers enjoy a significant advantage in perceptions of their interpersonal skills? To address this, we present the following research question:

R.Q. 2: Will others perceive 50-year-old to have better interpersonal skills than 25-year old when age is not an emphasized or prominent factor?

We employ an experimental design in which participants read a vignette about a remote employee's workday and evaluate the employee's performance. This design allows for causal statements about how age affects perceptions of employees' technological competence. We also examine how the participant's age may moderate the relationship between the target employee's age and the performance evaluation. Additionally, we collect information about participants' technological competence, remote work experiences, and interactions with older and younger coworkers.

While prior research exhibits evidence of the existence of in-group bias, the application of this concept to the context of older workers appears to be less consistent. The Chiu et al. (2001) findings of a positive correlation between participants' age and their favorable perception of older workers' adaptability and job effectiveness served to support the notion of in-group bias. This is aligned with the "Contact Hypothesis" that posits that agreements among various group members can help alleviate intergroup discrimination and antagonism (Henkens, 2005). When individuals belong to a particular category, they often perceive less disparity within that group (Henkens, 2005; Pettigrew, & Tropp, 2006). However, work by Finkelstein et al., 1995 revealed that older raters did not demonstrate a preference for older workers over younger ones in their evaluation of job qualifications. This absence of in-group bias among older raters essentially suggests a dissonance with the robust trend from the social psychology for in-group preference (Tajfel, 1981) that also did not hold for age-related negative stereotypes (see Kirchner & Dunnette, 1954) nor self-stereotypes expressed by the older individuals (Nosek et al., 2002).

Consequently, we seek to examine whether positive in-group attitudes show up, whereby members of their own group will be more inclined to appraise an employee's technological experience in a positive light, at least explicitly.

Based on this rationale, we put forth the following:

Hypothesis 1: Similarity in age will be positively related to favourable perceptions of the employee's technological competency.

We are also intrigued by the potential impact of participants' age on their experiences with learning new technologies in the workplace. Individuals vary in their inclination to perceive threat and anxiety as stress-related emotions, which is determined by their level of self-confidence, also referred to as self-efficacy (Bandura, 1989). Individuals who are high on self-efficacy believe in their capacity to use cognitive resources and take necessary actions to complete tasks (Bandura, 1986). Their optimistic outlook and visualization of success scenarios counteract potential feelings of threat and anxiety, resulting in a reduced struggle when confronted with task demands. Conversely, those who are low on self-efficacy are more inclined to visualize failure scenarios and focus on their personal shortcomings and failure (Bandura, 1989). Research indicates that higher self-efficacy is associated with decreased stress when encountering high task demands, such as work overload (Nauta, Liu, & Li, 2010). As such, computer self-efficacy may prove to be an effective tool in managing stressors such as mental workload during computer-based tasks.

However, research also indicates that stereotype threat can undermine performance (Oliveira & Cabral-Cardoso, 2017). When faced with negative stereotypes, individuals may

avoid engaging in the stereotyped domain (see Steele, 1997). Subtle cues or reminders can activate stereotypes, leading individuals to unconsciously behave in ways that reinforce these stereotypes, ultimately impacting their experiences. It is worth investigating whether an individual with a negative experience in adapting to technological change will face adverse effects when encountering another technological shift.

In essence, we aim to examine the persistence of age stereotypes related to technological self-competency and self-efficacy. Specifically, we are interested in testing/replicating insights on self-stereotypes (Snyder & Miene, 1994; Levy, 1996), which suggest that at some point, as people age, they internalize age-related negative stereotypes (i.e., the reference age membership group becomes self-identified reference group). Consequently, perceived negative judgments about older people lacking technological prowess and, therefore, avoiding learning technology are attributed to one's own membership group. As a result, individuals begin to self-ascribe prevalent beliefs about their age membership group, including negative stereotypes.

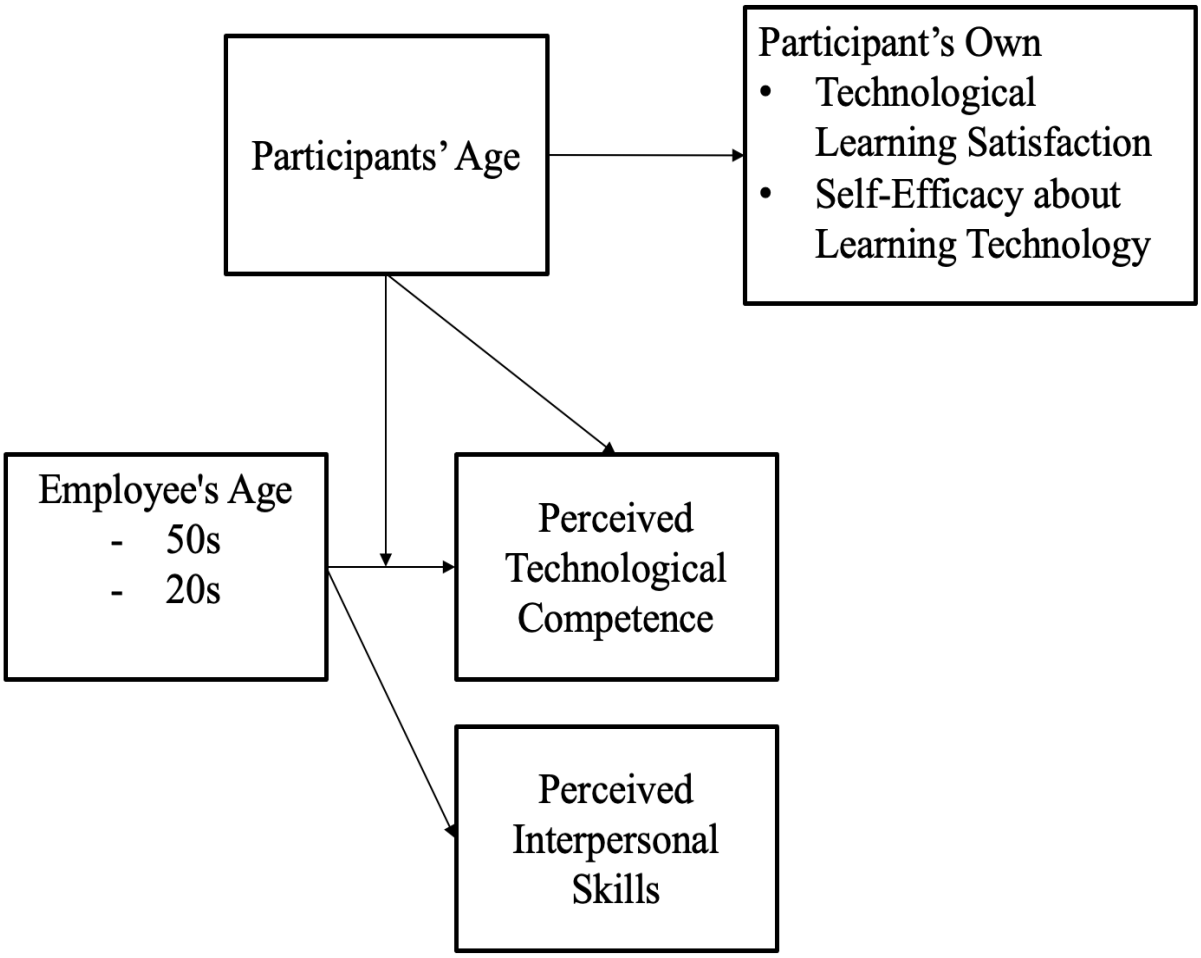
In such situations, self-stereotyping may hinder one's performance simply by anticipating the learning of new technology. To this end, we investigate the following two hypotheses:

Hypothesis 2: One's age is negatively associated with satisfaction in learning technology.

Hypothesis 3: One's age is negatively associated with perceptions of self-efficacy in learning technology.

The proposed relationships are demonstrated in the research model:

Figure 1: *Proposed relationships*



Method

Participants

To have a diverse sample representative of both younger and older workers, we recruited participants from two cohorts. Participants in the first phase of data collection were students at a Canadian university (n = 266) who completed the study in exchange for a participation credit towards a course. Among these 266 students, 68% reported having either part-time or full-time jobs concurrent with being a student. In the second sample, all participants (n = 93) were full-time employees in various Canadian organizations and were recruited via a snowball principle (Goodman, 1961) using the researchers' networks.

Participation was on a voluntary basis. The data collection took place over three weeks. The primary data were collected via an online questionnaire. The web link inviting to complete the survey was 1) embedded in the Participant Pool, available to students to earn an additional credit towards a course; 2) sent via email to the researchers' networks, such as LinkedIn. Specifically, over 150 invites were issued with a short request to participate and to forward the link to their colleagues and friends. The questionnaire was available in two versions, for a computer and for a mobile device. The first page of the questionnaire (in both rounds) began with the consent form. If participants agreed to participate, they continued with the survey. Those who did not consent to participate were advised to close the browser and could no longer continue with the survey. The research design and methods were reviewed and approved by the University's Ethics Review committee.

Initially, 381 people started the survey, however, 22 of them (6%) abandoned it before completing the survey. Thus, the final sample size was 359 participants, of whom 247 (69%)

were women, and 109 (30%) were men; three participants (0.8%) chose not to identify with either gender.

In the first subsample, on average, participants were $M = 22$ years old ($SD = 3.23$) with individual chronological ages ranging from 18 to 37 years. 63% of participants reported working part-time, and 6% were employed full-time. Participants who reported being employed worked in diverse industries, including 20% in the accommodation/food/beverage sphere, and another 20% in financial services. 48% of those employed participants reported working with young adults, 19% worked with midlife adults, 13% worked with older adults, and 20% reported working with diverse age adults.

In the second subsample, on average, participants were $M = 44$ years old ($SD = 10.80$) with individual chronological ages ranging from 25 to 66 years. The average age in the second sample was close to the age of an older worker as it is defined legally in the US workforce at or over the age of 40 (Age Discrimination in Employment Act) and as defined by the Organization for Economic Co-operation and Development (OECD) of 50 and older (OECD, 2006). 93% reported being full-time employed, and 5% reported being part-time employed. 59% of the participants worked in education, and 22% worked in financial services. 42% of participants reported working with diverse age adults, and 43% reported working with midlife adults.

All participants had some prior experience with computers, either through school or through job experience.

Design and Procedures

Our model was tested using an experimental design. We asked participants to read a vignette that describes an employee, "Alex," who is working from home, using a variety of work

technologies. The vignette was approximately 550 words in length. The information about an employee in the vignette served as a control condition. There were four experimental conditions, i.e., versions, of the vignette randomly presented. Each vignette varied the age of the employee; we manipulated age and gender in four versions of the script (as shown in Figure 2). For each randomly assigned condition, 175 (49%) participants were presented with a younger employee condition, and 183 (51%) participants were presented with an older employee condition. In the vignette, Alex's "younger sibling" was said to be having a 25th (younger Alex) or 50th (older Alex) birthday. The intention was to suggest Alex's approximate age, in a believable but unobtrusive context. Then we asked participants to evaluate the employee's performance using a survey questionnaire measure (Appendix). We furthermore explored how the age of the participant moderated the relationship between Alex's age and the evaluation of Alex's performance. Age 50 for older Alex's sibling was selected based on earlier research, that demonstrated employees aged 50 faced age discrimination (Chiu et al., 2001).

Figure 2: *Vignette*

Alex is an analyst working full time at a non-profit organization. For the last six months ***she [he]*** has been working full time from home. Working from home has meant that Alex accomplishes her tasks on her desktop computer, through a remote VPN connection to her office computer, and on the telephone.

As she always does on a weekday, Alex woke up at 7:15 am and made her coffee. Alex logged on to VPN at 7:56 am and reviewed her emails. Already there were two messages from colleagues and one from her department head. She checked her calendar for the upcoming meetings and drew up a to-do list for the day. She then made a phone call to one of her colleagues who had questions about the file-sharing system her team was using. During the phone call, Alex's computer prompted her to restart to install some updates.

Alex took the opportunity during the restart to go to her kitchen and get another cup of coffee. When she returned, she found that she had been logged out of VPN. She tried logging in again, but that did not work. She had to phone the IT support desk to explain the issue, and get the problem fixed. That took almost 40 frustrating minutes, and by the time she was able to access her mail again, she found two urgent emails that required immediate attention. She replied to these emails, and she scheduled a follow-up meeting with another unit member.

At 9:30am Alex joined a Teams meeting that concluded at 10:45 am. At the meeting, a colleague recommended a report which she knew she needed to read. The report turned out to be less useful than the colleague indicated it would, so Alex abandoned it after a few pages. She returned to reviewing and answering her emails and at 12:30pm she logged out to take her lunch and to walk around the neighborhood to stretch her legs. During the walk, her younger sister, Annie, sent her a text message. She suddenly remembered—Annie's ***50^{th} [25^{th}] birthday*** was coming up the next week, she'd have to think about what she could buy Annie as a gift.

After the lunch break, Alex had another interdepartmental meeting that lasted until 2:30pm. An issue that came up during the meeting made her realize that she had better read the report her colleague had suggested after all. She opened the document on her screen and began reading again. The report was very technical and a struggle to keep reading. It was a welcome distraction when her doorbell rang, and she went out to receive a UPS delivery. She took a moment to open the package and check the contents—some exercise equipment she had ordered. Back at her desk, Alex discovered yet another email marked "urgent." It took 30 minutes on the phone to resolve the issue; this brought her to 4pm.

In the past Alex had usually left the office at 4 pm to catch her train to go home, however for the last several months since working from home, Alex did not have a train to catch. She decided to catch up on her emails and finally logged out from the VPN for the day at 5:30pm. She was looking forward to trying out her new exercise equipment.

Note. (Version 1—Alex is female and older. Version 2— Alex is female and younger; Version 3—Alex is male and older; Version 4—Alex is male and younger. Bold & italics were removed in the actual vignette seen by participants).

Measures

i) *Employee's age* and *gender* were manipulated in a vignette (Figure 2). After reading the vignette, participants were given a questionnaire to rate their perceptions of the employee.

ii) *Perceived technological competence of Alex*

Participants were instructed to rate Alex on the following six items slider scale: 'In your perception, Alex is: (a) Capable; (b) Competent; (c) Efficient; (d) Confident; (e) Intelligent; (f) Skillful'. With respect to each item, the scale of responses ranged from 0 (Not at all) to 100 (Extremely). These items were selected based on Fiske, Cuddy, Glick, & Xu (2002) as standard measures used in stereotype research. Cronbach's alpha for the reliability of *perceived technological competence* measure as assessed for this sample was 0.94 and deemed acceptable for practical use (Tavakol, & Dennick, 2011).

iii) *Perceived interpersonal skills*

Participants were asked to rate their perceptions of Alex on the slider scale that ranged from 0 (Not at all) to 100 (Extremely) and contained the following six items based on Fiske et al. (2002): 'In your perception, Alex is: (a) Well-intentioned; (b) Trustworthy; (c) Friendly; (d) Sincere; (e) Good-natured; (f) Warm. The measure was found to be reliable and acceptable for use ($\alpha = 0.92$).

iv) *Manipulation check*

Participants were presented with a final question after they have completed all ratings: ***'Returning back to the story you began with, how old, do you think, is Alex?'***, to estimate and enter the chronological age of the employee described in the vignette. This item was measured as a continuous variable.

We also asked the respondents to think about their own recent experience of learning a new technology.

v) *Participant's technological learning satisfaction*

Our participants indicated the extent they agreed with five statements with respect to their own learning experience with the new technology recently. These statements were included to assess the participants' own satisfaction with their learning experience. '***Thinking about your learning experience with the new technology, please indicate the extent of your agreement with the following statements:'***

The five-point Likert-scale asked to respond "1 – Strongly Disagree → 2 – Disagree → 3 - Neither agree nor disagree → 4 – Agree → 5 – Strongly Agree" with each item labeled. Examples were 'My learning experience was positive' and 'Learning the new technology was enjoyable'. There items were adopted from Hu & Hui, (2012). The measure was found to be reliable and acceptable for use ($\alpha = 0.88$).

vi) *Participant's perceived self-efficacy about learning technology*

We also included nine items for participants to self-assess whether, in general, participants could learn to use a new technology system under a variety of conditions. For each condition, participants rated themselves how confident they were to learn the new system. '***The following questions ask you to indicate whether, in general, you could use a new technology system under a variety of conditions. For each condition, please indicate how confident you are that you would be able to learn the new system.***

Example, *"I would be confident I could learn the new system if..." '* The examples included, 'If there was no one around to tell me what to do' and 'If I had only the technology manuals for reference'. The Likert scale consisted of seven points, with only

the endpoints labelled, ranging from “1 – Not confident at all” to “7 – Totally confident”. The labels were deliberately excluded to allow participants to assign their own subjective value of confidence. As noted by Heymann & Lawless (2013), it is important to keep in mind that the difference in magnitude of attributes between two alternative points on a scale may not be equal. The items were adapted from Compeau & Higgins, (1995) and Hartzel (2003). The internal consistency for the measure was found as acceptable (α = 0.86).

Apart from the experimental measures, we also gathered data on the participants' personal experiences with colleagues of different age groups. The age of the participants was measured as a continuous variable, while gender was represented as a nominal variable (with [1] indicating female, [2] indicating male, [3] indicating non-binary/third gender).

Results

Data Integrity

Every effort was made to ensure data were reported and analyzed in their original form. Notwithstanding these attempts, issues with missing data arose during the analysis, such as incomplete questionnaire items. Out of the original sample size of $N = 381$ participants who showed interest in the study, 22 participants had missing data in their responses. To address this while preserving the highest possible data integrity, participants with missing data were excluded from the analysis. As a result, the final sample size was reduced to $N = 359$.

Responses to the Experimental Vignette

Our research questions compared the evaluations of the hypothetical employee described in the vignette, 20-something-year-old Alex, with the evaluation of 50-something-year-old Alex.

Research Question 1 asked, "Will others perceive a 50-year-old as less competent than a 25-year-old in managing technological change when age is not an emphasized or prominent factor?". We were interested in whether participants viewed the technological competence of older Alex differently than that of younger Alex. Alex's perceived technological competence was measured on a 100-point scale that ranged from 0 to 100. We discovered that there was no significant difference in perceived technological competence rating between the group of younger Alex ($M = 68.08$, $SD = 17.45$) and the group of older Alex ($M = 67.25$, $SD = 17.46$); $t = 0.448$, $p = 0.654$. Therefore, both younger and older Alex was seen as being adequately skilled in using work-related technologies.

Similarly, in Research Question 2 we asked: "Will others perceive 50-year-old to have better interpersonal skills than 25-year-old when age is not an emphasized or prominent factor?".

Alex's perceived interpersonal skills' score was measured on a 100-point scale, the scale ranged from 0 to 100. Our analysis revealed no statistical difference in perceived interpersonal skills ratings between the two groups, the younger Alex group (M = 71.54, SD = 16.44) and the older Alex group (M = 70.91, SD = 16.43), t = 0.360, p = 0.719. Therefore, it can be inferred that both the younger and older versions of Alex were evaluated as having reasonably good interpersonal skills.

To sum up, we wanted to see by embedding age in a broader context, whether the stereotypes still appear. Based on our sample, they do not. When our participants had sufficient and equivalent information about the employee (e.g., Alex's entire working day), the employees, i.e., the younger Alex, and the older Alex, were not seen differently based on their age in terms of technological competence and interpersonal skills. On the contrary, both employees were perceived as competent to a reasonable degree and having a moderate degree of interpersonal skills.

Manipulation Check

As mentioned previously, we ensured that Alex's age was mentioned in the vignette but was not very salient. The goal was to prime the reader using the sibling's age to the approximate age range for Alex, but at the same time not to explicitly label Alex as either too young or too old to avoid automatic age stereotyping. It became important, therefore, to do a manipulation check. Thus, the last question about the vignette was: 'How old is Alex?'. We noticed a large range in participants' responses to this question. Oddly enough, not everyone respected the manipulation check perfectly nor responded appropriately based on the randomly assigned manipulation (Alex's younger sister aged 50 versus 25). Among our participants, 72% were

moderately accurate in estimating Alex's age, as their guesses fell within a range that was close to their age of the sibling described in the vignette. However, it is important to note that a smaller percentage, 54%, demonstrated a higher level of accuracy, with their age estimates falling within a narrower 5-year difference. We went back to our research questions and examined again the relationships between perceived competence and perceived interpersonal skills and Alex's age, based on the participants' own estimation of Alex's age. We analyzed our two research questions from earlier, however, this time, no age anchors were specified, i.e., we dropped "50-, 25-year-old" and used Alex's age as a continuous variable to analyze: 1) "Will older Alex be perceived by others to be less competent than younger Alex in managing technological change?", and 2) "Will older Alex be perceived by others to have better interpersonal skills than younger Alex?"

The Pearson correlation between Alex's estimated age and Alex's perceived technological competence was not statistically significant, $r = 0.036$, $p = 0.248$ (see Table 1), therefore, we do not find a difference in ratings between older and younger Alex's perceived technological competence. The result suggests that Alex's age is not a good index of technological competence. Indeed, workers differ in their technological abilities, however, according to our sample, not based on their age. The results from both measures, the causal relationship from the experimental portion and the point estimate from the manipulation check, a more precise measure, suggest that there were no statistically significant differences in the perceptions of technological competence between the older and younger Alex.

On the other hand, we found a statistically significant positive relationship between Alex's age, that was estimated by the participants, and their perceptions of Alex's interpersonal skills, $r = 0.112$, $p < 0.05$. This result is counter to what we found using an experimental design with age as a nominal variable with randomly assigned two groups (i.e., 20-something-year-old

Alex and 50-something-year-old Alex). This finding is inconsistent with what we discovered based on the research question 2 results earlier, and indeed, this finding is linking age with better interpersonal skills.

To better understand the intricate relationship between age stereotypes and perceived technological competence, we examined whether an additional factor – the participants' own age – influenced the connection between their estimation of Alex's age and their perceptions of Alex's technological competence (Mackinnon, 2011). Using a multiple linear regression with a moderation analysis, Alex's age and participants' age were entered as the predictors, and Alex's technological competence scores were the outcome variable. Additionally, a moderation analysis was conducted by creating an interaction term between Alex's age, as estimated by the participants, and the participants' age to see if the interaction shows up in the model. See Table 2 for the regression results.

The model did not explain the variance as demonstrated by the r-squared value of 0.013, indicating that merely 1.3% of the variance in Alex's perceived technological competence scores can be explained by Alex's age, participants' age, and the interaction between Alex's age and participants' age. Overall, the model was non-significant ($F(3, 355) = 1.522$, $p = 0.208$). Adding the interaction term did not contribute much to this model ($\beta = -0.027$, $b = -0.516$, $Sr^2 = 0.00005$, $p = 0.632$).

Participants' Own Experiences at Work

This section will reveal our findings for Hypothesis 1 through 3, that examined whether each participant's age was related to: perceptions about Alex's technological competency (H1),

to participants' technological learning satisfaction (H2), and to participants' own self-efficacy about learning technology (H3).

Table 1

Descriptive Statistics, Reliabilities and Correlations among Study Variables

Variables	*M*	*SD*	1	2	3	4	5	6
1. Competence	67.653	17.437	(0.935)					
2. Interpersonal Skills	71.216	16.418	0.812**	(0.916)				
3. Alex's Age	33.68	10.46	0.036	0.112*	-			
4. Participants' Age	27.48	11.375	0.109*	0.102†	0.235**	-		
5. Participant's Technological Learning Satisfaction	3.849	0.785	0.169**	0.149**	-0.033	-0.072	(0.882)	
6. Participant's Self-Efficacy about Learning Technology	5.427	0.915	0.124*	0.203**	0.034	-0.026	0.232**	(0.856)

Note. Cronbach's alpha reliabilities are on the diagonal in parentheses.

*$p < .05$ **$p < .01$ (2-tailed)

†$p < .05$ (1-tailed)

Table 2

Results of Regression Analysis of Alex's Age and Participants' Age on Perceived Technological Competence Scores

Variables	*Alex's Age*	*Participant's Age*	*B*	*β*	Sr^2	
						$R^2 = .013$
Alex's Age	-	0.240	0.014	0.009	0.0013	
Participant's Age	0.240	-	0.177	0.115	0.0119	
Participant's Age * Alex's Age[a]	0.002	0.289	-0.516	-0.027	0.00005	

Note. [a]Participants' age *Alex's age interaction product

*$p < .05$

Hypothesis 1 proposed that similarity in age will be positively related to favourable perceptions of Alex's technological competency. We analyzed the data from the subsample (n = 93) of participants who were full-time employees, ranging in age between 25 – 66 years old. Initially, we split the participants into two groups of younger, and older ones, dividing them by the median age split (Mdn = 44) and used Alex's age based on the randomly assigned groups, i.e., 25 and 50. A two-way ANOVA was performed to analyze the effects of the participants' age and Alex's age on Alex's technological competency. Homogeneity was not an issue, based on Levine's test, groups were equally distributed (p = 0.466). Results revealed no statistically significant interaction between the effects of participants' age and Alex's age (F(1, 88) = 1.445, p = 0.232), see Table 3a. We found neither the simple main effect for the participants' age (F(1) = 0.225, p = 0.636 nor the simple main effect for Alex's age group to produce a statistically significant difference in Alex's ratings of technological competence between younger and older ages of groups (F(1) = 0.128, p = 0.722).

Additionally, we split the participants into two groups of younger, and older ones, dividing them by the median age split (Mdn = 44) and this time we used Alex's age as the estimated age from the manipulation check question: "How old is Alex?". We split into two groups of younger and older Alex using the median age (Mdn = 35). Based on Levine's test, groups were distributed fairly equally, causing no homogeneity issues (p = 0.479). Results revealed no statistically significant interaction between the effects of participants' age and Alex's age (F(1, 87) = 0.862, p = 0.356 (see Table 3b). The lack of interaction suggests that the magnitude of the differences between the means in Alex's technological competence ratings does not depend on the participants' age. Simple main effects analysis showed that there is no statistically significant difference in mean Alex's technological competence between older and

younger participants ($p = 0.468$), nor there were statistically significant differences between technological competence in younger versus older Alex ($p = 0.703$), see Table 3b. Therefore, Hypothesis 1 was not supported. The similarity in age did not influence the perceptions of Alex's technological competency according to our sample. The results reported in this section are summarized in Table 3.

Hypothesis 2 and Hypothesis 3 are grounded in participants' own work experiences. We asked participants to describe a recent technological change that impacted their activities, including its nature, timing reasons, and their current level of comfort with the change, for example, Basic, Moderate, Advanced, or Pro. Table 4 presents examples provided by participants, illustrating recent technological changes that impacted their activities. Based on their qualitative reactions, it appears that there is no relationship between age and the ability to adapt to technological change.

Table 3a

ANOVA – Ratings of Technological Competence Based on Participants' Age and Alex's Age (25 v 50)

Variables	*SS*	*df*	*MS*	*F*	*p*	η^2
Participants Age	65.037	1	65.037	0.225	0.636	0.003
Alex's Age	36.918	1	36.918	0.128	0.722	0.001
Participant's Age * Alex's Age	417.415	1	417.415	1.445	0.232	0.016
Residual	25413.86	88	288.794			

Note. Type III Sum of Squares

Marginal Means – Participants' Age * Alex's Age (25 v 50)

				95% CI	
Participants Age	Alex's Age	Marginal Mean	SE	Lower	Upper
Younger	Younger	66.962	3.469	60.068	73.855
	Older	72.548	3.708	65.178	79.917
Older	Younger	72.967	3.899	65.219	80.714
	Older	69.942	3.212	63.559	76.324

Table 3b

ANOVA – Ratings of Technological Competence based on Participants' Age and Estimated Alex's Age

Variables	*SS*	*df*	*MS*	*F*	*p*	η^2
Participants Age	156.428	1	156.428	0.532	0.468	0.006
Alex's Age	42.891	1	42.891	0.146	0.703	0.002
Participant's Age * Alex Age	253.359	1	253.359	0.862	0.356	0.010
Residual	25580.28	87	294.026			

Note. Type III Sum of Squares

Marginal Means – Participants' Age * Estimated Alex's Age

				95% CI	
Participants Age	Alex's Age	Marginal Mean	SE	Lower	Upper
Younger	Younger	68.377	3.934	60.558	76.196
	Older	70.439	3.363	63.755	77.123
Older	Younger	74.633	4.583	65.525	83.742
	Older	69.689	3.031	63.664	75.713

Hypothesis 2 proposed that participants' age would be negatively linked to participants' technological learning satisfaction. Looking at participants' technological learning satisfaction score, that was measured on a 5-point scale, the scale ranged from 1 to 5, we see that participants were above the midpoint of the scale (M = 3.849, SD = 0.785), indicating they were somewhat satisfied with their recent experience with technology. A Pearson correlation analysis revealed that the participant's own age did not emerge as a significant predictor of the participant's technological learning satisfaction scores, r = -0.072, p = 0.172. We find no relationship between age and self-reported technological learning satisfaction among our participants. Thereby, Hypothesis 2 was not supported (see Table 1).

Next, the participant's ability to learn new technology under a variety of conditions was measured on a 7-point scale, the scale ranged from "1 – Not confident at all" to "7 – Totally confident". Reflecting on their own self-efficacy about learning technology, by and large,

participants were quite confident in their learning abilities ($M = 5.427$, $SD = 0.915$). There was a non-significant negative relationship between participant's age and perceptions of own self-efficacy about learning technology scores, $r = -0.026$, $p = 0.626$. We do not find evidence that age was linked to self-efficacy about learning technology. If anything, this shows that with age self-efficacy to learn new technology does not decline. Thus, Hypothesis 3 was not supported.

Supplementary Analysis

Beyond all, participants tended to perceive Alex as being similar in age to themselves, as demonstrated by a significant correlation coefficient of $r = 0.235$ ($p < 0.001$). It was fascinating to find that many participants were able to identify with Alex, as many of them shared similar experiences of *staying* home, working remotely, using online services, trying to keep in shape, and connecting with others through virtual means during the pandemic. This genuine connection that participants had with Alex is a significant achievement for our study.

A few additional points were worth noting. Based on our sample, we note that perceptions of competence scores and perceptions of interpersonal skills' scores were significantly positively related, $r = 0.812$, $p < 0.001$.

Our results show that the more satisfied the participants were with their recent technology learning, the more confident they were about their ability to learn technology in the future, $r = 0.232$, $p = 0.001$. It can mean that those who had a good experience with new technology were assured to manage well if and when the time presented to learn something new at work.

Also, participants who are older gave slightly higher scores to older Alex in perceived interpersonal skills, $r = 0.102$, $p = 0.027$ (Table 1), suggesting they see older people as slightly more skilled interpersonally.

Table 4: Examples of participants' recent technological changes

Describe a recent technological change that affected your activities. Technological change may mean the introduction of new software, new equipment or a change in how existing technology is used. What was the change? When and why did the change occur? What is your current level of comfort with the technology? E.g., Basic, Moderate, Advanced, Pro.
"We were recently introduced to a new technological software. The software allows us to test the temperatures of meat and chicken using a special thermometer. Before this change, we used to record the temperature projected by hand. However, the new software has a bluetooth system that automatically records the temperature into the new digital system. This change occurred one month ago. The change occurred because it is easier to record and tract previous temperatures if ever needed. My comfort level with this technology is moderate." (22-year-old)
"We recently switched accounting software for our company. The switch was made as the previous system used was for smaller businesses while we were growing at a fairly quick rate and needed something more suitable for our size. It occurred about 4 months ago, just over one year into my employment there. None of us working there had ever had experience with this system before so we were all slightly sceptical going in. Fortunately, we have orchestrated proper trainings and we are slowly getting the hang of it and getting more comfortable with it." (22-year-old)
"The place of employment where I work part time is the hospital. The different departments evidently need to keep files on hand of the many patients that come in. They recently installed a new software program where all patients' files are always updated and can be referred to at any time. The change occurred one year ago to improve the ways in which patient files were handled and used. It makes the entire organization run more efficiently, and it also saves paper. It even makes it easier to see the patient's appointments (past and future) as well as their doctors. My current level of comfort with technology is moderate. I can figure out how to use most new pieces of technology, but I do not know how it all works as well as the specific components." (19-year-old)
"When the pandemic started, everyone was forced to do their activities from home. For me it was somewhat difficult to adapt to an entirely online modality. Specially with Zoom and other platforms used for online classes. After a little more than a year studying with this new modality, I would say my level of comfort is Moderate. I think that the saying "all young people know about technology" is a myth. As not everyone that is young is an expert in the field." (19-year-old)
"Moderate, we had to change up the database software used as well as the update the operating systems for our work. This proved to be a difficult task for most of my co-workers as they were familiar with the outdated software. "(24-year-old)

(continued)

Table 4: Examples of participants' recent technological changes (continued)

"I work at a bank as a teller. About 2 months ago our desktop computers got switched for tablets. The primary differences are the interface which didn't take too long to get used to as well as the process in which we do credit card applications for clients. Before we would simply fill out a form and print it for the client to sign and then scan and email the form over to another department for it to get approved or refused. However, now the whole process is done directly on the tablets and in some cases, clients will know right away if they were approved for the credit card as well as their limit. This new process is more time consuming. However, I find it to be a better and more advanced way to do credit card applications since clients can get an answer right away in most instances. My current level of comfort with the new technology is moderate. "(22-year-old)
"New Equipment. I work at Canada Post, and they recently introduced a machine that connects payments, signatures, and receipts. I am very comfortable with technology (Advanced). They introduced the new machine as the old machine was causing a lot of errors and it saved time." (21-year-old)
"I have advanced/pro level of comfort with technology and have relied heavily since working from home. My problem is when I used to work from home occasionally, that day was completely free of distractions and I was able to focus to catch up on work I couldn't otherwise complete at the office. Since working from home full time, there is no opportunity for me to catch up on things unless I work overtime when everyone else has logged off. I see a lot of myself in Alex's day, and while well intentioned at the start of my day/week, other work prevents me from doing my actual job. It's extremely frustrating and it's taking a toll on my mental health." (36-year-old)
"Change in system and access to work files due to remote work. I believe that technology is somehow challenging as it can be unpredictable and we rely entirely on its efficiency in order to fulfill our daily tasks." (26-year-old)
"I am new in my role which involves the financial reconciliation of the ledger and sales. There are 3 sources where data needed to be reconciled. 2 are new and one I am already familiar with. My knowledge of the 2 new data sources was basic but understanding the end goal of the reconciliation exercise helped in the familiarization of the process." (46-year-old)
"Hosting training or social events through MS Team. At the beginning of the pandemic, we started with Zoom for training sessions, then later on we switch to MS team after more upgrades in MS team. However some new functions (such as visual background) is not available on iPad or my old laptop with Window 8; when we tested the polling functions, team members experienced different platform/issues depends on their devices; we want to minimize any potential issues as it's very difficult to trouble shoot for other staff during a virtual meeting, at the end we often decide to abandon the latest/most advance option to launch certain activities, and stick to the most basic functions. My current level of comfort with MS team is Moderate." (39-year-old)

(continued)

Table 4: Examples of participants' recent technological changes (continued)

"Change in payroll system last august to remove manual intervention and put more controls in place. I have a moderate knowledge of the system." (60-year-old)
"Implementation of a new software required because of the implementation of a new HR system. The project took 1,5 years to complete with endless meetings, testing, developing of help documentation, training and end user support which is still ongoing. Level of comfort - Pro." (43-year-old)
"In August 2020, we introduced a new HR software – Workday, it was time for a new software the old one was out of date. I consider my technology comfort to be moderate-advanced." (55-year-old)
"Working from home on a laptop using VPN and Remote Connect since March 2020 due to COVID-19. I would estimate my level as Moderate." (58-year-old)
"MS Team was introduced last year when we started working from home. It's a very good tool to have meetings or have discussions among teams. In the beginning, when I didn't know different features of this, it was a bit annoying but slowly slowly as we got to know about it's tools and features, it became very interesting to use this tool. I feel that my current level is advanced. " (38-year-old)
"New ERP. Old ERP was outdated and needed to be changed. Change occurred less than a year. An upgrade of the old system was not going to improve change. Pro." (48-year-old)
"Recent technological change: Use of business communications platforms which occurred in Marc 2020 due to the need to work remotely. Advanced." (49-year-old)
"Having to rely solely on our laptops, from using zoom, teams to one drive. This was due to working from home. In the beginning it was an adjustment, but it didn't take long to get used to it and adapt accordingly. In fact, as time went on, it actually made my job a lot easier. It was easier to reach out to colleagues and share information or ask questions. It's easier to schedule meetings and complete tasks that would have taken longer if we were at the office. Now we can schedule and complete many meetings in one day. Reaching others are also easier. Before we had to call them or go to their office and if they were unavailable, we had to go back. Now we use Teams to see if they're available and we can easily talk to them quicker. I think this has had a very positive effect on our tasks." (46-year-old)
"Pre-covid, I worked as a hostess at a restaurant. When I first started, we would record reservations in a book by hand. A few months later, my manager replaced the handheld book with a computer software to record reservations. It definitely took some time to adjust to this technological change, but with some training, I grew to enjoy it better. Taking reservations and placing the table is a lot easier now." (19-year-old)

Discussion

The primary objective of this study was to investigate potential differences in the evaluation of technological competence and interpersonal skills in older versus younger workers. Additionally, given previous research findings that suggest raters have a tendency to distinguish between workers based on certain criteria (Fasbender & Wang, 2017), we investigated whether participants' own age might serve as a moderating factor that could influence these perceptions. Our research questions and hypotheses were examined through a vignette and online questionnaire. Contrary to common stereotypes, we did not identify any significant difference between the ratings of perceived technological competence between older and younger workers. This finding aligns with previous studies by Ng & Feldman (2012), Chiu et al., (2001), and Murphy and DeNisi (2022), suggesting that stereotypes may be diluted by individuating information and people do not form their perceptions solely based on age. Relatedly, perhaps even for those participants who hold strong stereotypes about older people, their stereotypes might have served as an efficient information processing tool (Allen et al., 2009), that helped to extract the novel, detailed information from the vignette and undermined the application of the age stereotype. Indeed, our results seem to corroborate the notion that age stereotypes are less prevalent than often presumed.

We also discovered that individual variability within the older adult population cannot be discounted. Our qualitative data, as evidenced in Table 4, suggests that age did not significantly affect people's responses to technological change. For example, at first, the person wrote down reservations in a book. But a few months later, their manager replaced the book with a computer program to record reservations. It was difficult to get used to, but after some training, the

individual found it easier and even enjoyable. The person at that time was 19 years old and it appeared the switch was a bit of a struggle. However, they got used to the new way of managing reservations using technology and they were happy with it.

Another 19-year-old perceived switching to an online modality as somewhat difficult to adapt. Furthermore, the person thought that the saying "all young people know about technology" was a myth. “As not everyone that is young is an expert in the field.” In parallel to these revelations, a 46-year-old person talked about working remotely full-time during the pandemic. At first, it was a bit difficult to adjust, but soon they got used to it. “…it actually made my work easier. It was easier to reach out to colleagues and share information or ask questions. It’s easier to schedule meetings and complete tasks that would have taken longer if we were at the office. Now we can schedule and complete many meetings in one day. Reaching others is also easier.” The person perceived reaching others through technology (i.e., “MS Teams”) as “easier”, and as saving time compared to calling or going to someone’s office, noting that technology has a “positive effect on or tasks”. In summary, our qualitative data suggest that age did not significantly affect people's responses to technological change.

The experimental findings indicate no significant differences in perceived interpersonal skills between the older and younger Alex. Our experimental findings differ from those of Kroon et al., (2018) where older workers were perceived more positively in terms of their interpersonal skills compared to younger workers.

However, the unexpected finding was based on a point estimate, the more sensitive measure, based on the question, ‘*How old is Alex*?’, a weak positive statistically significant impact was observed, indicating that older Alex was perceived as more skilled interpersonally.

This intriguing finding does indeed suggest a link, albeit a weak one, between age and better interpersonal skills. It is notable that participants detected this subtle connection based on age difference alone. This finding is consistent with prior research (Chiu et al, 2001; Cuddy & Fiske, 2002; Finkelstein, Burke, & Raju, 1995). Evidence from earlier research on positive age stereotypes had shown older workers were perceived as more trustworthy, honest, dependable, good-natured, and sincere (Rosen & Jerdee, 1976; Cuddy & Fiske, 2002). It is possible, that older Alex may have been perceived as more proficient in effectively engaging with individuals throughout the day, given that age often brings with it a wealth of diverse experiences, including encounters with people from various backgrounds.

When we looked at the potential moderating effect of participants' own age in the relationship between the age of Alex and the ratings of technological competence, we found the model was non-significant. Adding the interaction term did not contribute much to this model. Our data did not suggest that Canadians hold on to age-related stereotypes when it came to rating the competence of Alex. The participants might have picked up on the specific job-related tasks that Alex performed, depicted in the vignette, as capable, well-organized, and skillful, regardless of the implied age. Possibly, and similarly to Ng & Feldman (2012), older employees may have fewer impediments to their workflow and, as such, older employees can fully focus on work-related matters while younger workers could be viewed as more vulnerable in finding work-family balance and juggling multiple personal roles.

Our investigation of the potential moderating effect of participants' own age on their assessments of Alex's technological competence yielded non-significant results. Counter to Fasbender & Wang (2017), we found that the age of the participants did not play a role in how the perceived technological competence of Alex was assessed according to the participants' own

age. Results are somewhat surprising, and contradict prior research (Levy, 1996; Nosek et al., 2002), whereby older people held similar attitudes toward their in-group members that were equally negative as attitudes held by the younger people toward the old. Results appear to agree with Murphy & DeNisi, (2022), who showed in their commentary that the content of age stereotypes is multiplicative, and stereotypes do not have identical negative effects. In our case, it looks as if the detailed information was sufficient to correct the age stereotype. Instead, our data suggest that participants might have based their ratings on the specific job-related tasks performed by Alex, depicted in the vignette, as capable, well-organized, and skillful, regardless of the implied age. This may be due to social desirability effects or demand issues, where participants provided responses in line with social norms or due to indirect age hints based on the sibling's age, respectively.

The results and implications of the three hypotheses in our study address unique aspects of age-related stereotypes in the workplace and together provide a comprehensive understanding of the role of age in shaping perceptions and experiences of technology-related competency.

Hypothesis 1 suggested that similarity in age will be positively related to favourable perceptions of Alex's technological competency. We aimed to see whether the average technological competency rating that older participants give to older Alex would be different (i.e., higher) than the technological competency rating that older participants give to younger Alex. And vice versa, would younger participants who read about older Alex give, on average, a different (i.e., lower) rating than younger participants who read about younger Alex? We found no significant difference in the average ratings of perceptions of technological competency of Alex between participants' groups, failing to support Hypothesis 1. This finding indicates that irrespective of the participants' age membership group, their perceptions of Alex's technological

competence did not waver, regardless of whether Alex is portrayed as older or younger in the vignettes or as was estimated by the participants themselves.

The lack of a relationship between participants' age and their perceptions of Alex's technological competence challenges the stereotype that older employees are less competent in handling technology. This is because older participants in our study tended to view Alex as equally technologically competent, suggesting that they may not hold age-based stereotypes about technology competence or that they may have a more nuanced understanding of the abilities of individuals across different age groups. Our finding implies that other factors, such as individual experiences, training, or familiarity with technology, may have a greater influence on perceived competence than age alone. Moreover, individuals may be more likely to view others, regardless of age, as technologically competent, potentially fostering a more inclusive and supportive work environment that values the technological skills of employees across all age groups. This is consistent with results by Finkelstein et al. (1995), who failed to find support for in-group bias. There was essentially no difference in older people's rating of older and younger worker's job qualification.

Hypothesis 2 proposed that participants' age would be negatively related to their technological learning satisfaction, implying that older individuals might be less satisfied with their technology learning experiences compared to younger individuals. However, the analysis demonstrated a non-significant relationship between participants' age and their self-reported technological learning satisfaction, failing to support Hypothesis 2. This non-significant relationship indicates that age does not play a significant role in determining an individual's satisfaction with technology learning experiences. Put differently, older individuals in our study were not found to be less satisfied with their technology learning experiences compared to their

younger counterparts. Our finding challenges prior research (Brooke & Taylor, 2005; Ng & Feldman, 2012) on the preconceptions that older employees may struggle more with adapting to new technology or have less satisfaction when learning new technological skills. Instead, it suggests that age is not a determining factor in an individual's ability to adapt and be satisfied with technological learning experiences. Perhaps the technology has become a part of our lives, people have been using technology at work and home, and recreationally for several decades. It is quite possible that the earlier studies that were done twenty-plus years ago on technological competence and relationship with age pertained to people who were not so much involved with technology, and certainly, not familiar with using smart phones to schedule their grocery deliveries, confirm dental appointments, book vacations, and perform check-in with airlines. If anything, this insight highlights the importance of providing equal opportunities and support for technology learning across all age groups, as it appears that age does not negatively impact satisfaction with such experiences.

Hypothesis 3 posited that participants' age would be negatively correlated with their self-efficacy about learning technology, suggesting that older individuals might feel less confident in their ability to learn and adapt to new technologies compared to younger individuals. However, the analysis showed a non-significant negative relationship between participants' age and their self-efficacy about learning technology scores, indicating that Hypothesis 3 was not supported. This non-significant relationship is counter to research on self-stereotyping (Snyder & Miene, 1994; Levy, 1996) and further implies that age does not play a substantial role in determining an individual's confidence in learning and adapting to new technologies. In other words, older individuals in our study were not found to be less confident in their ability to learn and adapt to new technologies compared to their younger counterparts. Overall, our findings challenge the

stereotype that older employees are less competent in handling technology, less satisfied with their technology learning experiences, and less confident in their ability to learn and adapt to new technologies. Instead, our results underscore the need for unbiased access and encouragement for individuals of all ages in technology learning, as age does not significantly influence one's confidence in learning and adapting to new technologies. However, it is vital to remain cautious of the potential for ambiguous behaviors to be misinterpreted to the detriment of stereotyped groups (Hilton, & Von Hippel, 1996), causing individuals to be perceived as more conforming to stereotypes than they truly are.

In our findings, we noticed an intriguing shift in the perception of technological competence and age. Contrary to earlier studies, the relationship between these two factors appears to be disappearing, while the correlation between perceived interpersonal skills and age remains. Perhaps this is due to the fact that technology has become deeply woven into our daily lives over the past few decades. Three decades ago, the picture was different. The individuals studied in the 1990s were less exposed to technology. As technology has become more accessible and user-friendly, the age-based disparity in technological competence seems to be vanishing. My mother, for instance, has been using computers and cell phones for over 20 years now. She is not intimidated to get the new smartphone, believing that she can and will be able to handle it.

However, when it comes to interpersonal skills, there is a different story. Age and experience enrich people’s abilities to interact and communicate effectively. From ancient Greeks to present-day societies, interpersonal interactions remain a constant part of human life. With age comes experience, which can enhance one’s ability to navigate complex social situations.

That said, the question of age-related stereotypes still lingers. Some people may resort to using stereotypes as a means of simplifying their understanding of others. This could be due to a lack of sufficient or individuating information, causing them to rely on subtle, implicit, or explicit cues. It might also be true that some older individuals internalize these stereotypes, especially those on the cusp of retirement. The mere thought of retirement could sap their motivation to learn new technologies or skills. In contrast, older individuals like Dr. Howard J. Tucker, who is 100 years old and still actively working, demonstrate that age is not a hindrance to working, learning, and developing new skills. Positive age stereotypes can indeed lead to decreased retirement intentions.

We live in a society that tends to focus on youth, which can negatively impact older people's self-perceptions, potentially affecting their cognitive and physical abilities due to negative stereotypes about aging. As people age, they are more likely to develop a healthy cynicism, having observed a variety of organizational changes, including technological upgrades. This cynicism is not limited to a specific age group, but rather a feature that can be found in people of all ages.

In our sample, we found that technological abilities varied among workers, but not according to their age. Some older individuals may self-stereotype, believing they are not adept at technology based on their age. This could be a self-fulfilling prophecy, or perhaps a motivation issue. Resistance to change exists in all age groups and is often influenced by personal situations or a perceived lack of necessity for change.

Organizations need to recognize the potential bias associated with age-related stereotypes and create an inclusive environment that supports and encourages employees of all ages to learn

and adapt to new technologies. In a world still recovering from the pandemic, as the workforce ages, it is clear that older workers are not just valuable – they are essential.

Our findings challenge prevailing age-related stereotypes, revealing that older employees do not perceive themselves as technologically inept, and are just as satisfied with their technology learning experiences as their younger counterparts. They also do not seem less confident in their ability to learn and adapt to new technologies. Stereotypes, including those related to age, can lead to biased perceptions. Recognizing and addressing these stereotypes, particularly regarding technological competence, is crucial for fostering a diverse and productive workforce.

Limitations and Future Directions

Our study, like all others, has its limitations. The first notable limitation is our sample. The data was collected from two primary sources, one of which was a student group with ages ranging from 18 to 37 years. This skew towards younger adults limited the range of some analyses (i.e., H1) and possibly concealed age-related stereotypes. While students are frequently used in social psychology research, the over-representation of younger adults in our sample is a potential confound. Future studies should consider age distribution when designing research on this topic. Although many of our participants were employed part-time and a small fraction full-time, their limited work experience may not have exposed them to a sufficiently diverse age range of colleagues. A study design that includes a minimum work experience requirement might offer a more comprehensive perspective on age-related perceptions in the workplace.

Another limitation is the nature of age as a variable. Age is a continuous variable, and the definitions of 'young' or 'old' can shift depending on one's own age. Given that the average age of

our combined sample was twenty-seven years old, the data might be too skewed towards younger participants. Future research could aim to focus on more mature participants to explore any age-related stereotypes or self-stereotypes in a work environment more effectively.

Another limitation of this study is its exclusive focus on Alex as a remote analyst, without providing participants with specific perspectives or roles in relation to Alex. Future research could enhance this investigation by assigning roles to participants, such as being Alex's manager, coworker, subordinate, or colleague from a different department. It would be insightful to explore whether perceptions of technological competence and interpersonal skills vary for older and younger workers, depending on the participant's assigned role. This could offer a deeper understanding of the potential moderating effect of the rater's relationship to the employee on the link between the employee's age and perceived competence.

We also recognize the geographic limitations of our study. Our sample was drawn from the Canadian workforce and a Canadian university student population. Despite Canada's multicultural nature (see *Canadian Charter of Rights and Freedoms*, section 27), further research on age stereotypes and self-stereotypes should expand to international samples, particularly when focusing on age and technology. Culture is the learning context, and the individual is the repository (Banaji, 2001). As technology becomes more accessible across all age groups, cultural differences in attitudes towards technology and aging may become more pronounced. As Mark Twain eloquently put it, "Age is an issue of mind over matter. If you don't mind, it doesn't matter."

Equally important, our study also had a self-selection bias, as participants had extrinsic motivations to participate, such as course credit or recommendations from colleagues or friends.

This type of sampling may not be truly representative and could potentially skew responses due to social desirability or demand characteristics.

Lastly, we found inconsistency in our results between experimental and correlational findings regarding the relationship between age and interpersonal skills. While our experimental data suggested no relationship, our correlational data indicated a weak yet statistically significant link. This inconsistency could be addressed in future research by considering additional factors that contribute to interpersonal skills, such as personality traits, demographic characteristics (i.e., nationality), and industry-specific influences (i.e., vocational aspirations). Exploring how different personalities may gravitate towards certain industries and how this might shape the development of interpersonal skills over time could provide a rich direction for future research.

Our study provides important insights and recommendations for addressing age stereotypes, yet it is crucial to note the shifting dynamics regarding age and technology use in the workplace. Firstly, we are witnessing a potential decline in technology-related age stereotypes within organizations. This can be attributed to the increasing indispensability of technology and the growing tech literacy among older generations. Notably, most individuals in their 60s have been engaging with computers for over thirty years and have been using cell phones for more than a decade. Secondly, the pandemic has likely contributed to breaking down age stereotypes, as the need for technology became universal across all facets of life. Whether for work, education, or basic online shopping, people from all age groups found themselves adjusting to a new digital-centric reality. This widespread reliance on technology likely fostered skill development across all generations, thereby softening the stereotype lines around age and technological competence.

Conclusion

Our study underscores that increased interaction with older colleagues can effectively challenge and mitigate negative stereotypes. We found no significant influence of age on technological competence, satisfaction with technology learning experiences, or self-efficacy related to technology learning, in line with prior research suggesting age does not significantly impact core task performance. As workplaces evolve into multigenerational spaces due to demographic shifts, the imperative grows for organizations to foster inclusive environments that respect, support, and value employees across all age groups, particularly in terms of adapting to and learning new technologies. It is essential to acknowledge that age-related stereotypes, both positive and negative, can profoundly impact older workers, with stereotype threats and self-stereotypes potentially undermining their performance and confidence in their abilities, thereby influencing their overall workplace success and satisfaction. By scrutinizing and addressing both explicit and implicit age attitudes, organizations can pave the way towards a more inclusive environment for workers of all ages. Such attention to age-related stereotypes and the cultivation of inclusive environments will enable organizations to effectively leverage the unique strengths of older workers, thereby promoting a more productive and harmonious workplace for all employees, regardless of age.

In considering the complexity of age stereotypes, it is important to note that individuals vary in their ability to navigate and cope with these stereotypes. Notably, we encounter what is referred to as the "paradox of well-being" (Whitbourne & Sneed, 2002). This concept describes the phenomenon where, despite the fear and devaluation directed toward them in society, older individuals often report high levels of life satisfaction. This underscores the resilience and the

positivity of many older individuals, who manage to maintain a sense of contentment even when dealing with age-related negativity in their everyday lives.

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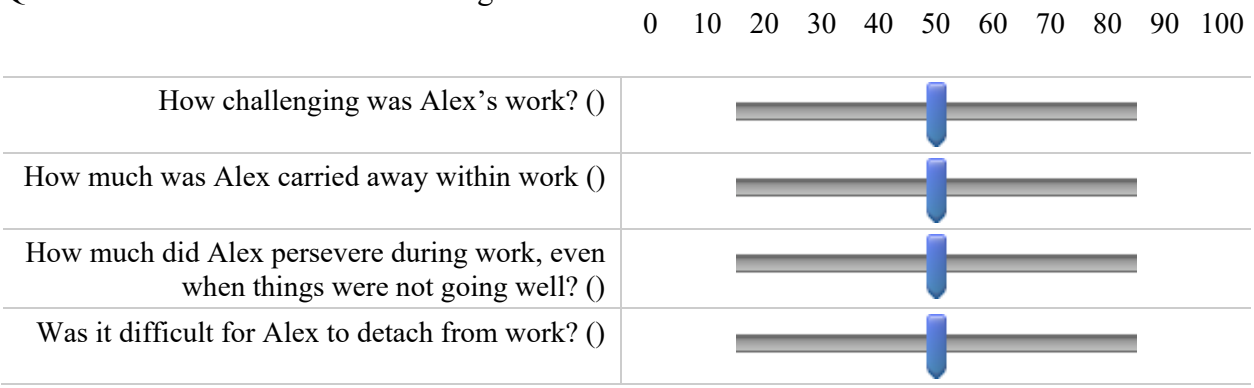
Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix
Survey Questions

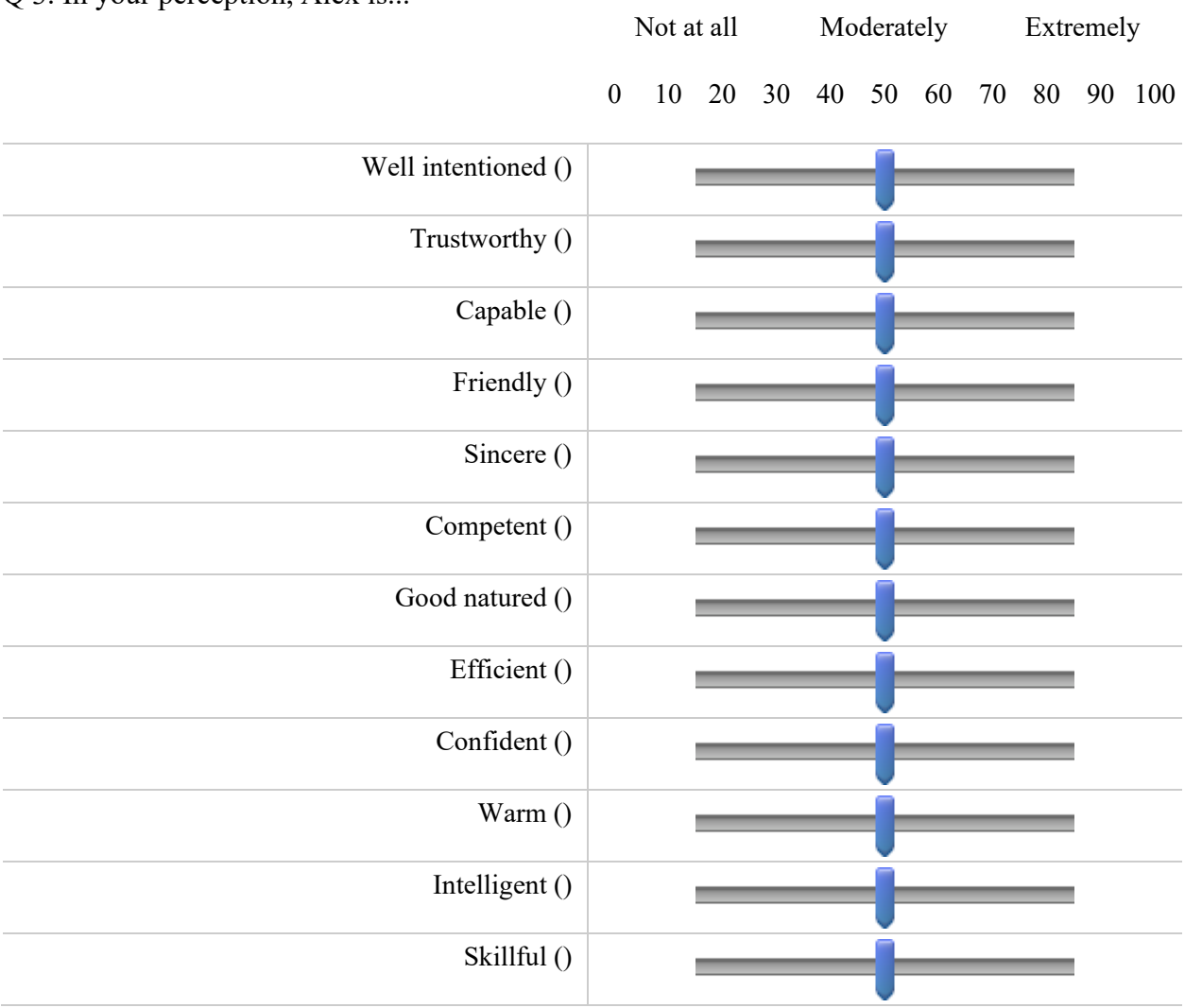
Q 1. Please rate Alex on the following:

	1-Strongly Disagree (1)	2-Disagree (2)	3-Neither agree nor disagree (3)	4-Agree (4)	5-Strongly agree (5)
Alex does a thorough job (1)	○	○	○	○	○
Alex can be somewhat careless (2)	○	○	○	○	○
Alex is reliable worker (3)	○	○	○	○	○
Alex tends to be disorganized (4)	○	○	○	○	○
Alex tends to be lazy (5)	○	○	○	○	○
Alex perseveres until the task is finished (6)	○	○	○	○	○
Alex does things efficiently (7)	○	○	○	○	○
Alex makes plans and follows through with them (8)	○	○	○	○	○
Alex is easily distracted (9)	○	○	○	○	○

Q 2. Please rate Alex on the following:



Q 3. In your perception, Alex is...



Q 4. Please estimate Alex's age: Alex is _____ years old.

_____

Q 5. Have you been working during the last 18 months?

- ○ Yes, part time (1)
- ○ Yes, full time (2)
- ○ No, I am a part time or full time student (3)
- ○ No, not during last 18 months (4)

Q 6. How long have you been working in your current organization? Please indicate the number of years.

_____

Q 7. How long have you been working in your current position? Please indicate the number of years.

_____

Q 8. In what industry are you employed?

▼ Accommodation/Food/Beverage Industry (1) ... I am not currently employed nor have I been employed during the last 18 months (28)

Q 9. Within your department, your co-workers are mostly

▼ Young adults (1) ... Diverse ages (4)

Q 10. Describe a recent technological change that affected your activities. Technological change may mean the introduction of new software, new equipment or a change in how existing technology is used. What was the change? When and why did the change occur?
What is your current level of comfort with the technology? E.g., Basic, Moderate, Advanced, Pro.

_____

Q 11. Thinking about your learning experience with the new technology, please indicate the extent of your agreement with the following statements:

	1-Strongly Disagree (1)	2-Disagree (2)	3-Neither agree nor disagree (3)	4-Agree (4)	5-Strongly Agree (5)
My learning experience was positive. (1)	○	○	○	○	○
Learning the new technology was a good idea. (2)	○	○	○	○	○
Overall, I am satisfied with the new technology. (3)	○	○	○	○	○
Learning the new technology was enjoyable. (4)	○	○	○	○	○
I had adequate resources and tools for learning the new technology. (5)	○	○	○	○	○

Q 12. The following questions ask you to indicate whether, in general, you could use a new technology system under a variety of conditions. For each condition, please indicate how confident you are that you would be able to learn the new system. Example, ***"I would be confident I could learn the new system if…"***

	Not confident at all, 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	Totally confident, 7 (7)
If there was no one around to tell me what to do. (1)	○	○	○	○	○	○	○
If I had never used technology like it before. (2)	○	○	○	○	○	○	○
If I had only the technology manuals for reference. (3)	○	○	○	○	○	○	○
If I had seen someone else using it before trying it myself. (4)	○	○	○	○	○	○	○
If I could call someone for help if I got stuck. (5)	○	○	○	○	○	○	○
If someone else had helped me get started. (6)	○	○	○	○	○	○	○

If I had a lot of time to complete the job for which the new technology was provided. (7)	○	○	○	○	○	○	○
If I had just a built-in help facility for assistance. (8)	○	○	○	○	○	○	○
If I had used similar technology before this one to do the same job. (9)	○	○	○	○	○	○	○

Q18 13. Indicate your age

_____

Q14. Indicate your gender

▼ Female (1) ... Non-binary/third gender (3)

Q 15. Some people find that their age in years (chronological age) is different from the age they feel. Please answer these questions about the **age you feel**:

	20s (1)	30s (2)	40s (3)	50s (4)	60s (5)	70s (6)	80s (7)	90s (8)
I feel as if I am in my... (1)	○	○	○	○	○	○	○	○
I look as if I am in my... (2)	○	○	○	○	○	○	○	○
I do most things as if I am in my... (3)	○	○	○	○	○	○	○	○