

Research Article

Does Perceived Ageism Widen the Digital Divide? And Does It Vary by Gender?

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Abstract

Background and Objectives: Existing literature presents a widening digital divide among older adults in addition to the consideration of the potential adverse impacts of ageism on internet use among the older adult population. Our study aimed to investigate (a) whether older adults' perceived ageism will be associated with their use of the internet and (b) whether the relationship between perceived ageism and internet use will be moderated by age groups and binary gender.

Research Design and Methods: Using the data from the 2016 Health and Retirement Study, regression analyses were separately performed by gender. Two measures of perceived ageism were considered: (a) self-perception of aging and (b) perceived age discrimination.

Results: Our findings suggested that greater exposure to ageism is generally related to less use of the internet. In addition, we found divergent patterns in the relationship between ageism and internet use by gender. For women, a lower level of internet use was predicted by more negative perceptions of aging, whereas men's internet use was associated with the experience of age discrimination. Furthermore, interaction effects between age groups and ageism varied across gender. The negative perception of aging was more strongly associated with less internet use in older women than middle-aged women. In comparison, the perceived age discrimination predicted less internet use in middle-aged men than older men.

Discussion and Implications: Our findings suggest that perceived ageism is significantly associated with internet use, and its association differs by gender.

Keywords: Attitudes and perception toward aging/aged, Technology, Gender issues

The digital divide refers to the disparities between people who do and do not have access to resources of information technology (Compaine, 2001). Internet access is stratified by demographic, socioeconomic, and health conditions, such that older age, poverty, less education, and poor health are associated with less internet use (see Hunsaker & Hargittai, 2018 for review). In the United States, for example, people with disabilities and Hispanic ethnicity had lower rates of digital adoption than the national average

(Pew Research Center, 2016, 2017a). Moreover, despite the increased use of the internet during the last two decades across age groups, use by older adults continues to lag behind younger populations in the United States (Pew Research Center, 2019a). Compared to 90% of younger Americans who went online in 2019, only 73% of older adults did so (Pew Research Center, 2019a). This age gap is particularly pronounced for the oldest age group; with 82% of 65- to 69-year-olds who used the internet, only 44% of

adults aged 80 and older reported using the internet (Pew Research Center, 2017b). In addition to individual-level factors (e.g., attitudes toward technology), the underdeveloped infrastructure needed for high-speed internet and limited broadband adoption are understood to shape the digital divide (Czaja et al., 2006; Korupp & Szydlik, 2005; Pew Research Center, 2019b). These findings call for further needs for exploring multilevel factors related to different rates of internet use among older adults.

Previous studies have focused on the internal characteristics of older adults as important determinants of their internet use (see Charness & Boot, 2009 for review). For example, a wide range of age-related changes in physical function and cognition, as well as computer anxiety, are reported to affect internet use. However, there is a lack of empirical research on whether broader societal/contextual factors might explain lower rates of internet use among older adults. Recently, societal factors such as ageism are suggested as one of the issues undermining internet use among older adults (McDonough, 2016). Defined as the negative views placed on aging and older adults (North & Fiske, 2012), ageism is shaped by the subtle or explicit prejudice, stereotypes, and discrimination against older adults (Ayalon & Tesch-Römer, 2018). Ageism is classified into self-directed and other-directed ageism. Self-directed ageism is defined as internalized negative societal views of older adults, which in turn shape unfavorable self-perception of one's aging (Levy, 2009). Other-directed ageism refers to age discrimination from external entities, such as other groups, policies, and institutions (Ayalon & Tesch-Römer, 2017).

According to the internal working model concept, mental representations of self and others carry forward, and influence thought, feeling, and behavior in adulthood relationships (Shaver & Hazan, 1987). Thus, expanding the self-efficacy concept, ageism may result in decreased self-esteem among older adults if they accept society's ageist beliefs. Relatedly, the stereotype embodiment theory (SET; Levy, 2009) posits that negative age stereotypes are internalized during the life course, and the internalized ageism operates in unconscious ways, producing self-fulfilling prophecies. This unfavorable self-view of aging can further hinder older adults from actively using internet technology (McDonough, 2016). Some older adults may devalue the benefits of fully utilizing the internet by internalizing ageist messages that they are internet-incompetent, inflexible, and cannot learn new things (McDonough, 2016). Self-directed ageism can also intensify feelings of discomfort with and mistrust of the internet, which may reflect, in part, lower initial usage rates (McDonough, 2016).

Other-directed ageism is manifested in various contexts and social structures (Ayalon & Tesch-Römer, 2017; Palmore, Branch, & Harris, 2005), which may negatively influence older adults' internet use behaviors. The negative stereotypes attached to older adults' use of the internet can establish implicit social modes of functioning

that shape both social behaviors and digital skills (Lagacé, Charmarkeh, Laplante, & Tanguay, 2015). Older adults are often portrayed as less avid internet users, lacking interest or unable to use digital technologies properly (Eurostat, 2018). Thus, perception of these unfair portrayals may cause older adults to have beliefs that underestimate the usefulness of the internet and raises internet anxiety (McDonough, 2016). Additionally, the perceived ease of using the internet is likely to be affected because older adults are depicted as being unable to adapt to technological innovations (Hetzner, Tenckhoff-Eckhardt, Slysachak, & Held, 2014). Experience of ageist discrimination may promote the idea that the internet is hard for older adults to use, resulting in older adults viewing their efforts as futile or embarrassing (McDonough, 2016).

In recent literature, studies have attempted to examine the potential relationship between gender and internet use among older adults; however, there have been mixed findings. Some evidence from Europe indicated that older men are more likely to use the internet than older women (König, Seifert, & Doh, 2018; Ramón-Jerónimo, Peral-Peral, & Arenas-Gaitan, 2013; Van Deursen & Helsper, 2015). Similarly, in a study of nationally representative older Americans aged 65 and older ($N = 6,476$), men were more likely than women to use the internet for various purposes, including communication, completing personal tasks, and handling health matters (Kim, Lee, Christensen, & Merighi, 2017). However, other studies found no gender differences in older adults' use of the internet after socioeconomic factors were controlled (Choi & Dinitto, 2013; Friemel, 2016). Yet other findings showed the reversed patterns of the gender divide, with women more likely to use the internet than men (Yu, Ellison, McCammon, & Langa, 2016). These discrepancies in the literature suggest that more research is needed to understand whether and how internet use varies by gender among older adults.

We argue that the relationship between ageism and internet use may depend on the age group and gender. The middle age–older adulthood transition is characterized by major life changes such as retirement (Helson, Soto, & Cate, 2006), which can trigger more negative perceptions of aging and increase susceptibility to ageism (Chopik, Bremner, Johnson, & Giasson, 2018). In addition, prior work on older adults' technology use noted that age groups differ substantially in rates of internet use, skills, and experiences (König et al., 2018; Sackmann & Winkler, 2013). For example, Americans aged between 50 and 64 had higher internet adoption rates and greater internet skills than older Americans (Hargittai & Dobransky, 2017; National Telecommunications and Information Administration, 2013). These findings emphasized heterogeneity between middle-aged and older adults. To this end, the current study used age categories, rather than using age as a continuous variable, to better pinpoint the differences between the middle-aged (50–64 years) and older adults (≥ 65 years). The age of 65 was chosen as the lower end

for the older group because it is the legally eligible age for aging-related social entitlements (e.g., Medicare and Social Security) in the United States. We expect that ageism factors will have a stronger association with internet use in the older group than in the middle-aged group.

Gendered ageism posits that women are likely to be doubly exposed to stigmatizing attitudes based on age and gender (McGann et al., 2016). Societal views depict older women more unfavorably than older men (Berger, 2017), and women tend to have greater concerns about growing older and hold more negative views of aging than their men counterparts (Ayalon, 2014). Thus, we expect that the negative relationship of ageism and internet use will be more pronounced in women compared to men. In addition, the moderating effects of the age group in the association between ageism and internet use may vary by gender. Recent studies have suggested that digital gender disparity may be cohort effects or subject to age (Hunsaker & Hargittai, 2018). König and colleagues (2018) found that adults aged 50–65 did not show significant differences in internet use between men and women, whereas adults aged 66 and older documented the male-dominated gender divide. Taking this into account, the stronger association of ageism and older adults' internet use may be particularly salient for women. However, given the limited knowledge on this topic, the current study did not specify the direction of these potential associations.

The primary aims of our study were, therefore, to investigate (a) whether perceived ageism will be associated with internet use among older adults, and (b) whether age groups and binary gender will moderate the association between perceived ageism and internet use.

Methods

Data and Sample

The data were drawn from the 2016 Health and Retirement Study (HRS). The HRS is a longitudinal panel of U.S. nationally representative individuals aged 50 and older and their spouses. Data have been collected biannually since 1992, and a wide range of individual characteristics (health, retirement, and family structure variables) are asked through face-to-face or telephone interviews. Further details about the HRS panel design, sampling strategy, and questionnaires are accessible through the HRS website (<http://hrsonline.isr.umich.edu>). As of 2006, the Psychological and Lifestyle Self-Administered Questionnaire (SAQ), which includes items on ageism and internet use, has been administered to a random half of the noninstitutionalized HRS participants (Smith, Ryan, Fisher, Sonnega, & Weir, 2017). In 2008, the other half of the HRS sample received the SAQ and the design has been repeated every 4 years.

The current study is based on the most recent (2016) data available. Information for ageism, internet use, age, gender, race/ethnicity, marital status, and education were obtained from the HRS core data. Some of the covariates (income

and health conditions) were derived from the RAND HRS data files. The RAND HRS is a cleaned, consolidated, and user-friendly version of the HRS data, developed by the RAND Corporation. One advantage of using the RAND HRS data is that it provides imputed values for income and health variables, using all information available with a consistent imputation model. In 2016, 6,146 respondents aged 50 and older completed and returned the SAQ by mail. Data with missing values resulted in 232 (3.77%) individuals being excluded, and the final sample consists of 5,914 respondents. The Institutional Review Board at the University of Michigan and the National Institute on Aging provided ethical approval for the HRS. All respondents provided written informed consent prior to the data collection. The HRS is funded by the National Institute on Aging (NIA U01AG009740) and the Social Security Administration.

Measures

Dependent Variable

Internet use was identified as the dependent variable and assessed by a single item: "Use a computer for email, internet, or other tasks?" Responses were coded as 1 = *never/not relevant*, 2 = *not in the last month*, 3 = *at least once a month*, 4 = *several times a month*, 5 = *once a week*, 6 = *several times a week*, and 7 = *daily*.

Independent Variable

The identified independent variable was ageism and assessment included both self-perception of aging (self-directed ageism) and perceived age discrimination (other-directed ageism). Self-perception of aging was measured using five questions from the Philadelphia Geriatric Center Morale Scale (Lawton, 1975): (a) Things keep getting worse as I get older, (b) I have as much pep as I did last year, (c) The older I get, the more useless I feel, (d) I am as happy now as I was when I was younger, and (e) As I get older, things are better than I thought they would be. Participants answered each question on a six-point Likert scale (1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *slightly disagree*, 4 = *slightly agree*, 5 = *somewhat agree*, 6 = *strongly agree*). After reverse-coding appropriate items (2, 4, 5), an average score was calculated, with a higher score representing more negative self-perception of aging. Internal consistency in the present study was high ($\alpha = 0.86$). Perceived age discrimination was assessed by individuals' experience of being mistreated by others due to their age and included six questions on experience of everyday discrimination in the past year (Williams, Yan, Jackson, & Anderson, 1997). Items assessed were: (a) You are treated with less courtesy or respect than other people, (b) You receive poorer service than other people at restaurants or stores, (c) People act as if they think you are not smart, (d) People act as if they are afraid of you, (e) You are threatened or harassed, and (f) You receive poorer service or treatment than other people from doctors or hospitals. The respondents rated each item

for frequency on a six-point Likert-type scale (1 = *almost every day* to 6 = *never*). The responses were dichotomized into “*never*” and all other response categories to reflect whether the participants had ever experienced any discrimination. Respondents then indicated their attribution of those experiences to personal factors such as age, race, gender, and physical disability (Kessler, Mickelson, & Williams, 1999). The respondents who attributed the discriminatory experiences to their age were identified as being exposed to age discrimination.

Control Variables

Established sociodemographic (Wagner, Hassanein, & Head, 2010) and health-related predictors of internet use (Choi & Dinitto, 2013; Czaja et al., 2006) served as control variables. Sociodemographic variables included age, gender (1 = men), marital status (1 = married or partnered), and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and Other). Racial/ethnic identification of “Other” included American Indian, Alaskan Native, Asian, and Pacific Islander. For moderation analyses, age was further categorized into two groups (1 = older adults [65 and older]; 0 = middle-aged adults [50–64]). Educational attainment and total household income were used as indicators of socioeconomic status. Education was assessed with years of formal schooling (range: 0–17), and household income was measured by income from all possible sources such as earnings, pensions, and social security. Due to high skewness, log-transformed values of income were used for the multivariate analyses. Working status was categorized as currently working or not. Concerning health conditions, the current study considered five indicators: chronic diseases, functional limitations, self-rated health, depression, and cognitive status. The respondents reported whether they had any of the following of eight chronic diseases diagnosed by a physician (high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis); then, the sum value was calculated (range: 0–8). For the functional limitations, the respondents indicated whether they had any limitations in activities of daily living (ADLs), including bathing, dressing, walking across a room, and getting in and out of bed. Participants’ responses categorized them into two groups: those who reported one or more limitations and those with no limitations. Self-rated health status was measured with a five-point scale (1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fair*, and 5 = *poor*); then, it was reverse-coded so that higher values represent better subjective evaluations of health. Depression was assessed by the eight-item Center for Epidemiological Studies—Depression scale (CES-D) scale, a shortened version of the original CES-D scale (Radloff, 1977). The respondents were asked to report whether they experienced the following sentiments most or all of the time: (a) felt depressed, (b) everything is an effort, (c) sleep is restless, (d) felt alone, (e) felt sad, (f) could not get going, (g) felt happy, and (h) enjoyed life. Total scores

were calculated by subtracting the two positive indicators from the negative items. Internal reliability was acceptable, with the Kuder–Richardson 20 coefficient of .80. In HRS, a 27-point scale that summarizes test scores from three subdomains of cognition (episodic memory, working memory, and speed of mental processing) assessed cognitive functioning. Following the Langa–Weir Classifications (Crimmins, Kim, Langa, & Weir, 2011), the participants were divided into Normal Cognitive Functioning (12–27 points), Cognitively Impaired but not Demented (7–11 points), and Demented (0–6 points) groups.

Analytical Strategy

Descriptive statistics were conducted to investigate the characteristics of the full sample and by gender. Next, *t* statistics or chi-square statistics were used to compare gender differences in sample characteristics, levels of internet use, and ageism. Finally, hierarchical multiple linear regression analyses were performed separately by gender to investigate the hypothesized relationships among internet use, ageism, and age group. Hierarchical multiple regression is the most commonly used statistical method to estimate moderating effects (Cohen & Cohen, 1975). Groups of predictors were entered in a series of steps: (a) sociodemographic variables (race/ethnicity, marital status, years of education, annual income, and working status) and health-related variables (self-rated health status, number of chronic diseases, having disability, depression, and cognitive status); (b) two types of ageism (independent variables) and age group (moderator); (c) an interaction term between each type of ageism and age group. Self-perception of aging was mean-centered to prevent potential high multicollinearity problems (Aiken & West, 1991). The multicollinearity problem was not present in the data with the highest variance inflation factor of 2.9 across models, which is lower than the commonly used cutoff value of 5.0 (Sheather, 2009). Statistical significance was set at a two-tailed ($p < .05$). All analyses were carried out using Stata 14.2. (StataCorp., College Station, TX).

Results

Sample Characteristics

Table 1 summarizes the sample characteristics of the full sample and by gender. More than half (60%) of the sample was composed of women. The mean age was 67 years ($SD = 10.72$), with a range from 50 to 98. Half (54%) of the sample was categorized into the older group (age ≥ 65), 65% were non-Hispanic whites, 56% were married/partnered, 37% were currently working, and 16% had difficulties in ADLs. On average, the respondents had 13 years of education ($SD = 2.96$) and rated their health status as good ($M = 3.1$, $SD = 1.02$). No significant gender differences were found for age, age groups, years of education, levels of self-rated health, and cognitive status. Nearly two thirds (69%) of men were married/partnered, whereas

Table 1. Sample Characteristics for the Full Sample and by Gender (N = 5,914)

Variables	Full sample (N = 5,914)		Men (N = 2,391)		Women (N = 3,523)		Chi-square/ <i>t</i> test
	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	
Age in years (range: 50–98)	67.36 (10.72)		67.46 (10.69)		67.29 (10.74)		-0.62
Older adults (Ref = the middle-aged [50–64])		3,214 (54.35)		1,282 (53.62)		1,932 (54.84)	0.86
Non-Hispanic white		3,839 (64.91)		1,587 (66.37)		2,252 (63.92)	8.81*
Non-Hispanic black		1,073 (18.14)		391 (16.35)		682 (19.36)	
Hispanic		746 (12.61)		310 (12.97)		436 (12.38)	
Other		256 (4.33)		103 (4.31)		153 (4.34)	
Married/partnered		3,328 (56.27)		1,649 (68.97)		1,679 (47.66)	262.83***
Education in years (range: 0–17)	13.13 (2.96)		13.21 (3.08)		13.07 (2.88)		-1.72
Annual household income (thousands)	75.88 (112.17)		87.59 (122.60)		67.94 (10.38)		-6.64***
Working status		2,169 (36.68)		965 (40.36)		1,204 (34.18)	23.46***
Comorbidities (range: 0–8)	2.27 (1.52)		2.22 (1.52)		2.31 (1.52)		2.14*
Having ADLs		917 (15.51)		342 (14.30)		572 (16.32)	4.43*
Self-rated health (range: 1–5)	3.13 (1.02)		3.16 (1.03)		3.12 (1.02)		-1.72
Depressive symptoms (range: 0–8)	1.36 (1.92)		1.12 (1.69)		1.53 (2.04)		7.98***
Cognitively normal		4,783 (80.88)		1,901 (79.51)		2,882 (81.81)	5.80
Cognitively impaired but not demented		964 (16.30)		412 (17.23)		552 (15.67)	
Demented		167 (2.82)		78 (3.26)		89 (2.53)	
Self-perception of aging (range: 1–6)	3.00 (1.11)		3.00 (1.11)		3.00 (1.10)		-0.08
Perceived age discrimination (yes)		1,715 (29.00)		693 (28.98)		1,022 (29.01)	0.00

Note: Race/ethnicity of “Other” includes American Indian, Alaskan Native, Asian, and Pacific Islander. ADLs = activities of daily living. **p* < .05. ****p* < .001.

less than half (48%) of women were married or partnered ($p < .001$). Men reported higher levels of annual household income than women ($p < .001$). Overall, women showed poorer physical and mental health with more reported numbers of comorbidities ($p < .05$) and higher levels of depressive symptoms compared to men ($p < .001$). Relatedly, the women participants were more likely to report difficulties in ADLs than their male counterparts (16% vs 14%, $p < .05$). However, the mean scores of self-perception of aging and the rates of perceived age discrimination did not differ across gender.

Gender Differences in Internet Use

Table 2 presents internet use by gender. The average scores of internet use were 4.93 ($SD = 2.61$) for men and 5.01 ($SD = 2.58$) for women. However, the difference was not statistically significant ($p = .20$). About 52% of the men and 54% of the women participants reported that they used the internet daily, while 26% of men and 24% of women never used the internet or reported not relevant.

Ageism and Internet Use

Table 3 shows the findings from the hierarchical multiple regression models predicting levels of internet use by gender. In Model 1, analyzing the main relationship of age group and ageism variables for men, the set of considered variables explained 33.6% of the total variance in internet use [$F(16, 2374) = 75.03, p < .001$]. After controlling covariates, older adults had less internet use than the middle-aged group. Model 2 added interaction terms of age group with self-perception of aging and perceived age discrimination. The experience of age discrimination was associated with less internet use ($B = -0.33, p < .05$). The interaction term between age group and perceived age discrimination was significant ($B = 0.63, p < .01$). However, no interaction between age group and self-perception of aging were found. Figure 1 presents the two-way interaction between perceived age discrimination and age groups for men. While older adults, in general, had lower levels of

internet use than the middle-aged, the relationship between age discrimination and internet use differed between age groups. In middle-aged men, those with experience of age discrimination were less likely to use the internet. However, older men showed a reversed pattern: those who reported having experienced age discrimination were more likely to use the internet. The total variance explained by Model 2 was 33.9% [$F(18, 2372) = 67.48, p < .001$].

Model 3 examines the main relationship of age group and ageism variables for women, and the total explained variance of Model 3 was 34.3% [$F(16, 3506) = 114.44, p < .001$]. Continuing, negative self-perception of aging ($B = -0.10, p < .05$) and older age group ($B = -0.91, p < .001$) were significantly associated with less internet use. Model 4 further included interaction terms of age group with self-perception of aging and perceived age discrimination, leading to a significant interaction between self-perception of aging and age group ($B = -0.28, p < .001$). As shown in Figure 2, older women with a more negative self-perception of aging were less likely to use the internet, whereas middle-aged women showed comparatively stable internet use regardless of their self-perception of aging. However, the interaction term between perceived age discrimination and age group was not significant. The total variance explained by the final model was 34.7% [$F(18, 3504) = 103.28, p < .001$].

Discussion

Previous studies on the digital divide have shown that older people are less likely to use the internet than their younger counterparts (e.g., Smith, 2014). Moving beyond the previous focus on the internal characteristics of older adults, the present research addressed the role of a societal factor, ageism. Specifically, we investigated (a) whether internet use will be significantly associated with self-directed ageism (measured with self-perception of aging) and other-directed ageism (measured with perceived age discrimination) and (b) whether age groups and binary gender will moderate these relationships. Our findings with a nationally representative sample suggested that greater exposure to ageism

Table 2. Descriptive Analysis on Internet Use by Gender ($N = 5,914$)

Variables	Full sample ($N = 5,914$)		Men ($n = 2,391$)		Women ($n = 3,523$)		<i>t</i> test (<i>p</i> value)
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Internet use (range: 1–7, mean [<i>SD</i>])	4.98	2.59	4.93	2.61	5.01	2.58	1.28 (.20)
Never/not relevant	1,491	25.21	627	26.22	864	24.52	
Not in the last month	206	3.48	80	3.35	126	3.58	
At least once a month	142	2.40	55	2.30	87	2.47	
Several times a month	171	2.89	66	2.76	105	2.98	
Once a week	149	2.52	60	2.51	89	2.53	
Several times a week	601	10.16	259	10.83	342	9.71	
Daily	3,154	53.33	1,244	52.03	1,910	54.22	

Table 3. Hierarchical Regression Analysis With Interaction Models Predicting Internet Use by Gender (*N* = 5,914)

Variables	Men (<i>n</i> = 2,391)				Women (<i>n</i> = 3,523)			
	Model 1: Main effects		Model 2: Interactions		Model 3: Main effects		Model 4: Interactions	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Self-perception of aging	-0.07	0.05	-0.05	0.06	-0.10*	0.04	0.05	0.05
Perceived age discrimination (Ref = no)	0.02	0.10	-0.33*	0.15	0.13	0.08	0.12	0.12
Age group (Ref = the middle-aged [50–64])	-0.94***	0.11	-1.11***	0.12	-0.91***	0.09	-0.92***	0.10
Self-perception of aging * age group			-0.04	0.08			-0.28***	0.07
Perceived age discrimination * age group			0.63**	0.20			0.03	0.16
Non-Hispanic black (Ref = NHW)	-0.42**	0.13	-0.41**	0.13	-0.50***	0.10	-0.50***	0.10
Hispanic (Ref = NHW)	-0.29	0.15	-0.28	0.15	-0.39**	0.12	-0.39**	0.12
Other (Ref = NHW)	0.09	0.22	0.10	0.22	-0.20	0.18	-0.24	0.18
Married/partnered (Ref = no)	0.28**	0.10	0.29**	0.10	0.24**	0.08	0.24**	0.08
Years of education	0.25***	0.02	0.25***	0.02	0.24***	0.01	0.24***	0.01
Annual income	0.19***	0.03	0.19***	0.03	0.16***	0.02	0.17***	0.02
Working status (Ref = not working)	0.44***	0.11	0.43***	0.11	0.49***	0.09	0.50***	0.09
Chronic disease	0.01	0.04	0.01	0.04	-0.03	0.03	-0.03	0.03
Having functional disability (Ref = no)	-0.23	0.14	-0.23	0.14	-0.26*	0.11	-0.23*	0.11
Self-rated health	0.09	0.05	0.09	0.05	0.14**	0.05	0.13**	0.05
Depressive symptoms	-0.06	0.03	-0.05	0.03	-0.00	0.02	-0.01	0.02
CIND (Ref = normal)	-0.83***	0.13	-0.82***	0.13	-1.12***	0.10	-1.11***	0.10
Demented (Ref = normal)	-1.72***	0.26	-1.75***	0.26	-1.45***	0.23	-1.44***	0.23
Overall <i>R</i> ² (<i>F</i> statistic)	0.336 (75.03***)		0.339 (67.48***)		0.343 (114.44***)		0.347 (103.28***)	

Note: CIND = cognitively impaired, not demented; NHW = non-Hispanic white.
p* < .05. *p* < .01. ****p* < .001.

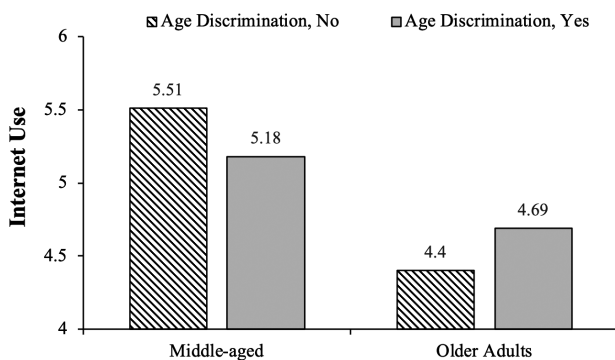


Figure 1. Interaction between perceived age discrimination and age group on men's internet use.

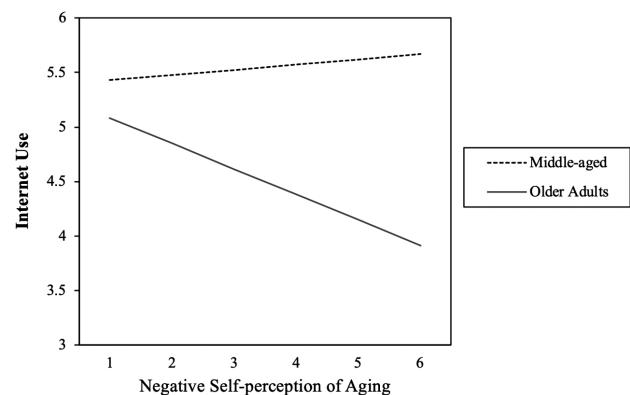


Figure 2. Interaction between self-perception of aging and age group on women's internet use.

is generally related to less use of the internet and that notable gender differences exist in associations among two types of ageism, age groups, and internet use.

On average, participants from the 2016 HRS used the internet “at least once a week,” with the mean score of 5; however, a significant digital divide was observed within the sample. Over half of the sample (53%) reported using

the internet daily, whereas a quarter of the sample reported no usage. A recent survey conducted in 2019 showed similar results that 27% of the participants aged 65 and older do not use the internet (Pew Research Center, 2019c). These findings suggest that a significant proportion of older people are still at risk of missing digital opportunities

despite benefits technology poses for older adults, for example, using the internet for health promotion (Czaja, 2015) and social support (Chopik, 2016).

Inconsistent with previous research that documented the digital gender gap (e.g., Ramón-Jerónimo et al., 2013), no significant differences between gender were found in levels of internet use. These results imply that in the United States, internet use among older women might be catching up with the rates of men. Indeed, some studies with older U.S. samples reported the absence of gender differences or even women being online more than men (Chang, McAllister, & McCaslin, 2015; Yu et al., 2016). With regard to ageism, approximately 29% of the study sample experienced age discrimination, and their levels of self-perception of aging were moderate, with an average score of 3 (range: 1–6). Neither the rates of perceived age discrimination nor the degree of self-perception of aging differed across gender.

While women and men were similar in their average levels of internet use, self-perception of aging, and the rates of reported age discrimination, our regression analyses revealed major different patterns in the association of ageism with internet use between gender groups. Women's internet use was associated with self-perception of aging, while men's use was significantly related to age discrimination. These findings support the arguments that older women are more susceptible to the impacts of internalized negative age stereotypes than older men (Berger, 2017; Chrisler, Barney, & Palatino, 2016). More interestingly, interactions between age groups and ageism varied across gender. For men, the middle-aged with experience of age discrimination were less likely to use the internet. However, a reversed pattern was found in the older group: age discrimination predicted more use of the internet. In contrast, perceived age discrimination did not have a significant relationship with women's internet use. Crisis competency theory (Kimmel, 1978) provides relevant theoretical grounds to understand these results. Individuals who previously experienced discrimination against their identity (e.g., sexism and racism) can develop coping skills better to successfully manage discrimination experienced later in life (e.g., ageism). In this sense, men may be less prepared for experiences of age discrimination compared to women, who might have been exposed to sexism early in their life course. In a similar vein, Lyons and colleagues (2018) found that age discrimination had a stronger negative association with men's mental health than women.

For women's internet use, the interaction term between self-perception of aging and age groups was significant. In older women, a more negative self-perception of aging was associated with decreased use of the internet, whereas middle-aged women's internet use appeared comparatively stable across different levels of self-perception of aging. Although women might have developed a better coping strategy against age discrimination than men, as mentioned

above, women may be more susceptible to self-directed ageism compared to men. Such assumptions are encapsulated in the framework of gendered ageism (Itzin & Phillipson, 1995) and the SET (Levy, 2009). At the intersection of sexism and ageism, older women are more likely to be exposed to double stereotypes across the life span, which can make them more vulnerable to the internalized ageism as growing older (Chrisler et al., 2016; McGann et al., 2016). Further research is needed to explore potential reasons accounting for described gender differences in the current study, particularly for underlying mechanisms (e.g., use intention or attitudinal factors) on how different forms of ageism are associated with internet use between gender.

Limitations

The study has several limitations worth noting. First, our use of a cross-sectional research design makes it difficult to draw any causal inferences. In theory, it is also speculated that lower levels of internet use might isolate older individuals, thereby leading to more negative perceptions of aging and a greater tendency to interpret others' behaviors as age discriminative. Future studies should consider longitudinal follow-ups to give a clearer understanding of the directionality of the association. Second, we employed a single-item measure for internet use, which limits the amount of information available. Further investigation can benefit from using multidimensional assessments that include a wide range of characteristics of internet usage (e.g., what activities and the total spent time). Third, our measures of ageism may not fully capture its multidimensional nature. Individuals' subjective experience or perception conceptualized ageism in the current study. However, at the societal level, assessment can consist of ageist stereotyping by other social entities (e.g., depicting older adults as incompetent in the media) (Ayalon & Tesch-Römer, 2017), which may also create an impediment to older adults' internet use. Future studies would benefit from employing other sources of ageism measures to understand how different layers of ageism can contribute to internet use among older adults. Fourth, it is important to note that gender was conceptualized as a binary variable (e.g., men vs women) in our study. Thus, data from people all along the gender spectrum or trans men and women were unable to be captured. Fifth, the current study was exploratory, and therefore, an overarching conceptual framework is needed in future research to explain the complicated associations among ageism, internet use, age groups, and gender. Lastly, although the considered variables of this study explained a significant amount of the variance of internet use (34%), there is still room for improvement. Previously well-documented predictors of internet use, especially concepts in the theoretical models (e.g., perceived usefulness and ease of use), should be included in future research to examine the link with ageism and their combined impacts on internet use.

Implications

Our study can make an important contribution to the field of older adults' technology adoption. Prior literature has primarily focused on identifying individuals' internal characteristics (e.g., perceived usefulness, discomfort, and computer literacy) as predictors of technology use (McDonough, 2016). However, the present study went beyond prior studies by showing the significant role of a macro-level factor. Not only that, but our findings might also relate to the existing theoretical models on technology adoption, potentially offering a broader picture of understanding the digital divide among older adults. For example, the technology readiness and acceptance model (Lin, Shih, & Sher, 2007) explains that one's technology readiness is associated with perceived usefulness and ease of use, further leading to use intention. Individuals who experience ageism might be less ready to use the internet, perceive it as not useful and find it more challenging to use. In line with this idea, Pew Research Center (2013) reported that noninternet users attributed reasons of nonuse to their feelings that they were "too old to learn."

This study also broadens the ageism literature by suggesting a different association between perceived ageism and internet use between gender. Self-directed ageism seems to have a stronger relationship with older women's use of the internet, whereas the experience of other-directed ageism is more closely related to middle-aged men's internet use. Although the majority of the gendered ageism literature emphasized men's privileged position when facing ageism (e.g., McGann et al., 2016), it should be noted that men are not entirely unaffected (Ojala, Pietilä, & Nikander, 2016), particularly from other-directed ageism. Instead, our findings suggest that qualitatively different processes of ageism and their varying outcomes might exist between gender.

In conclusion, for the literature that documented the role of personal factors in the use of the internet, the present study contributes to a better understanding of the digital divide among older adults by examining previously unexplored societal factors of internet use. More importantly, our findings showed that perception and experience of ageism are significantly associated with the use of the internet, but differentially between men and women. These findings provide preliminary support for gender-tailored intervention strategies, which can help older individuals to attenuate the potential adverse effects of ageism on internet use. Existing studies have shown that older adults can become active users of digital systems once accustomed to the internet (Eurostat, 2018). Building on the current study, future research might focus on the underlying mechanisms of how each type of ageism is related to internet use between gender using a qualitative research method to develop specific intervention recommendations and aging policies.

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Conflict of Interest

None reported.

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