

# **Revisiting the Digital Divide: Generational Differences in Technology Use in Everyday Life**

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Sex and generational differences in uses and perceptions of technology were examined among 262 participants (104 men and 158 women), ranging in age from 18 to 92. Participants reported their attitudes toward using technology, the contexts of their technology use, and their choices regarding types of devices and social networking services (SNS) use. Specifically, we explored questions that have not been posed in previous work, such as perceptions of user-friendliness of various forms of technology (e.g., websites), use of technology to avoid work or face-to-face communication, and self-reported feelings of anxiety and addiction related to technology. Analyses revealed no sex differences in daily technology use (e.g., hours per day on Facebook). Observed sex differences included women reporting more frustration with technology and different motivations for technology use, whereas men reported more ease with new technology. Generational differences emerged as central in choices for technology use, including older adults finding both cell phones and websites less user-friendly than both middle aged adults and young adults. Older adults reported being less anxious than other groups if they realized they had left their cell phone at home. Also, older adults were less likely to report that technology has significantly altered how they communicate with others versus both younger groups. Generally, the digital divide in technology use is found between the oldest adults and the two younger groups. Increased technology use by seniors might be facilitated by offering individualized training in community sites.

Technology has a central and evolving role in American society. Technology is defined in a number of ways, including being a tool that people use for intellectual and social purposes (Luppardini, 2005). Indeed, people of all ages use technology for interpersonal communication, information, and entertainment, but are there differences in the degree to which it is central to their lives and the contexts in which they use it? It is important to examine the demographic factors that may predict comfort with, use of, and preference for different types of technology, as

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it becomes ever more necessary for organizational and personal communication. Generation, or age, has recently been reported to be a more important predictor of technology use than sex (Van Volkom, Stapley, & Malter, 2013) and to be dependent upon context. The current study builds on past research by examining sex and age differences together as well as exploring demographic differences in attitudes toward and use of technology (e.g., frustration felt when using technology, use of a cell phone to make calls and send text messages).

### **Age Differences in General Technology Use**

Despite technology use being generally prevalent in American society, there are data that suggest both similarities and differences by age. For example, fifty-five percent of adults access the Internet via their mobile phone and adults under 50 years old are just as likely to use mobile Internet access as teenagers (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Recent reports of the percentage of teens who own a tablet (25%) are almost the same for adults between 18-50 years old (23%). However, in general, older adults tend to express less interest in technology (e.g., computers), and use less variety of technology than younger adults, which affects how prevalent technology is for older users (Czaja et al., 2006). Younger users (18-28) of technology usually have more experience with various types of technology and functions of technology (Olson, O'Brien, Rogers, & Charness, 2011), such as experience with different computer parts and computer functions. Older adults (65-90) seem to understand some types of advanced computer functioning, but they usually have less experience with them than younger adults. Recent data from PEW foundation studies revealed that older adults eventually adopt new technologies, but do not necessarily do it as quickly as younger adults (Zickuhr & Madden, 2012).

The younger population appears to have more positive attitudes concerning technology than the older population (Czaja et al., 2006; Purcell, Brenner, & Rainie, 2012; Van der Kaay & Young, 2012). Researchers found that older participants (60-91) expressed less interest in technology and a less favorable attitude towards technology than the middle-aged (40-59) and younger participants (13-39). When further analyzing negative perceptions of technology, the older population reported a variety of frustrations with technology. In research conducted on adults 85 years and older, participants expressed being frustrated with the overreliance of society on technology and the lack of human contact due to the increased usage of automated systems (Heinz et al., 2013). Participants specifically noted being upset by the utilization of technology for social interactions and frequently expressed the feeling that technology is too complex for them to fully understand. However,

they would like to see technology be of use to them, including aiding them with their transportation needs, helping them remain independent, and improving their health. Despite frustrations, participants were still open to technology use.

#### **Age Differences in Internet Use**

With respect to the Internet, younger adults generally have been using the Internet longer and use it more frequently than their older counterparts (Olson et al., 2011). Older adults are also less experienced with using touch screens on various devices such as phones, computers, and tablets. A common use of the Internet includes using search engines such as the popular search engine Google (Purcell et al., 2012). Young adults and college students are the most frequent users of search engines. Within the older population of adults, adults under 50 years old are the most likely to use search engines, with adults 50 and over being the least common users of search engines.

#### **Age Differences in Cell Phone Use**

The majority of American adults own some type of cell phone (Lenhart, Ling, Campbell, & Purcell, 2010). Young adults ages 19 to 21 do the most text messaging with a cell phone, a behavior that dramatically decreases following these years (Ling, 2010). More recently, in a previous three-generation study, we also observed that the youngest adults sent and received more texts than the middle aged and older adult groups (Van Volkom et al., 2013), but the middle aged group made the most cell phone calls, so there are generational differences in the manner in which people use the same devices.

#### **Age Differences in Use of Technology for Social Networking**

Age differences have also been reported for participation in social networking sites. Facebook continues to be the most popular and well-known social networking website with more than two-thirds of Americans using it (Rainie, Smith, & Duggan, 2013). Older adults (30 and older) are far less likely to use Facebook, and those who have a profile use the site less frequently than younger users (18-29). When asked to report how many “friends” they had on Facebook, recent reports among a community sample revealed age differences across adulthood, with the young adults reporting the most “friends” (Van Volkom et al., 2013).

#### **Age Differences in Emotions Associated with Technology**

The emotions people experience using technology may affect future use of technology and how they view technology in general. Individual

and group differences appear to affect what type of emotional reaction users have to technology (Cotton, Ford, Ford, & Hale, 2012; Czaja et al., 2006; Heinz et al., 2013; Junco, Heiberger, & Loken, 2011; Rosenthal, 2008; Shapira, Barak, & Gal, 2007; Shedletsky, 2006, 2012; Smith, 2012; Van der Kaay & Young, 2012; White et al., 2002).

There is a clear generational difference in emotional reactions. Older adults generally experience more negative emotions than younger adults (Czaja et al., 2006; Rosenthal, 2008; Shedletsky, 2006; Van der Kaay & Young, 2012). Adults experience more anxiety about using technology than college students (Shedletsky, 2006). Older adults also tend to express a desire for technology to be simplified, and report feeling intimidated by computers and express concerns about breaking them (Heinz et al., 2013). Similarly, older adults reported the most anxiety when using technology (e.g., computers) in Czaja et al.'s 2006 study.

The older population has found ways to combat the obstacles they face when using technology. The most common way to cope with these challenges is by seeking help from others, whether it is family, friends, or professionals (Rosenthal, 2008). Generally speaking, older adults who experience anxiety and lack confidence when using computers will most often seek help from people rather than using books or manuals to help them learn how to use computers and other technology. Taking classes to better understand how to use technology appears to effectively reduce technology-related anxiety and also demonstrates that adults who experience anxiety are capable of learning how to use technology and becoming comfortable with it despite their negative emotional reactions (Shedletsky, 2006). Another effective means of combating negative emotional reactions to technology is a mentor system where the younger generation tutors the older generation on computer use (Shedletsky, 2006). While both the mentors and the mentees usually come into this experience feeling anxious (Shedletsky, 2012), those being tutored experience less anxiety and stress with using technology following the mentoring experience and both the mentors and mentees consider the experience to be a positive one.

Despite the fact that technology elicits negative emotions in its users, there are also many positive emotional outcomes associated with technology use (Cotton et al., 2012; Shapira et al., 2007; White et al., 2002). Older adults who learn to use computers and Internet operations are less likely to suffer from depression and loneliness, and may benefit from an improved overall life satisfaction and control (Shapira et al., 2007). When researchers compared adult-learners and adult non-learners of technology, the non-learners experienced a deterioration of their well-being while the learners reported an increase in their well-being following a computer class. Therefore, not only did learning to use

technology help improve well-being, it may have also prevented deterioration of well-being with aging. In interviews conducted with adult technology-learners, researchers found common themes which provided further insight into improved well-being. These themes included: learning, involvement, social aspects, and positive feelings (Shapira et al., 2007). It seems that learning to use the Internet brought about positive emotions because using the Internet is viewed as a youthful activity, it allows for elderly people to communicate with others through a new medium, and keeps older adults up-to-date and involved, which may explain the reduced feelings of loneliness.

While older adults may be slower to adapt to new technologies (Olson et al., 2011), and may experience more anxiety and challenges with respect to technology (e.g., Shedletsky, 2006), learning to use technology is associated with some positive outcomes. However, these researchers did not compare the pre/post results of older adults learning to use the internet to pre/post results of younger adults learning to use the Internet to see if the positive outcomes found in this study can truly be attributed to learning to use the Internet specifically or just learning something new in general. It is possible that the positive emotional outcomes detected by Shapira et al. (2007) may be the result of the positive outcomes that are associated with taking part in self-expanding activities, or new and novel activities which expand one's sense of self (Aron & Aron, 1986). It is possible that the experience of doing something novel with the help and instruction of a professional helps improve well-being rather than the use of computers and the Internet themselves. However, earlier research is consistent with the findings of Shapira et al. (2007). When comparing older adults who use the Internet to older adults who do not use the Internet, Internet-users are less lonely, less depressed, and have more friends than non-users (White et al., 2002). Additionally, adults 50 years old and older who regularly use the Internet for sending and receiving emails, or for any other purpose, are less likely to be depressed (Cotton et al., 2012). This suggests that staying current with technology and making use of new technology may benefit the older population's mental health, which provides valuable positive support for how technology can be useful in benefitting society.

### **Age Differences in Technology-Related Skills**

Since demographic differences have been found with respect to who uses technology more (e.g., Olson et al., 2011), who views technology more favorably (e.g., Czaja et al., 2006), and who tends to be more comfortable with using technology (e.g., Rosenthal, 2008), it is important to explore demographics and how they relate to technology skill level. Since lower levels of efficacy are associated with higher levels of task

anxiety, understanding which users experience the lowest sense of efficacy with technology use can help researchers understand how technology-related anxiety and technology skill level are related (Muris, 2002). The oldest adults generally experience more anxiety (Rosenthal, 2008) and view technology more negatively than the younger adults (Czaja et al., 2006). This can have numerous implications for the technology-related skill level of the older population.

Skill level can influence likelihood of using technology (Wang & Wang, 2010). The following factors all play a role in whether people will make use of technology: how technology will benefit them, how much effort they will have to put in to using technology, whether they perceive that others expect them to use technology, how enjoyable the experience will be, how useful the technology will be, and how capable they feel they are to use technology. Technology-related self-efficacy may be important to the discussion of technology-related skills.

Users' skill level can influence whether they use technology (Wang & Wang, 2010) and younger users are more likely to possess technology-related skills (Czaja et al., 2006; Shedletsky, 2006; Van der Kaay & Young, 2012; White et al., 2002). When analyzing users' efficacy and interest in technology, older adults ages 60-91 score the lowest followed by middle-aged adults aged 40-59 (Czaja et al., 2006). Even when comparing undergraduate college students on their perceived aptitude for computer technology, students over 25 perceived themselves to have lower aptitude for computers than students under 25 (Smith, 2012). Users who feel that they have low efficacy for computer usage are interested in increasing their knowledge and computer skills (Rosenthal, 2008). The strongest motivating factor for older adults attempting to improve their skills is the ever-changing world we live in and a desire to stay up-to-date with new technological advances. These users also expressed a desire to improve upon their skills for using technology in general, not just computers specifically (Van der Kaay & Young, 2012).

### **Sex Differences in General Technology Use**

Generally speaking, men tended to report using technology more in previous decades (Sherman et al., 2000), and to report using a wider variety of devices and programs than women (Czaja et al., 2006). However, no differences were reported with respect to males' and females' usage of computers (Czaja et al., 2006). The current study is designed to lend insight into the contexts in which sex differences may continue to exist over a decade after Sherman et al.'s (2000) research.

The discrepancy in findings regarding sex differences in technology use may depend upon which type of technology is being discussed and the way that it is used. For example, Sherman et al. reported in 2000 that

men were more familiar with computers than women, whereas women reported using email more frequently than men. This could be partly a result of men having used computers and the Internet for longer than women (Jackson et al., 2008). Women also have reported a higher intensity of cell phone usage than men, whereas men play video games more often than women (Jackson et al., 2008).

### **Sex Differences in Internet Use**

Some research has examined sex differences in the Internet usage of males and females, and found that consistent with the current study's focus on context, males and females use the Internet for different purposes. Females of all ethnicities were more likely to report using the Internet to browse the Web, make online purchases, research their interests, and use a search engine (Jackson et al., 2008), whereas African American males were the least likely to use the Internet for these purposes. Overall, women tended to use the Internet for communication-related purposes, whereas males were less likely to use the Internet for this purpose. Women have also reported more frequent use of Facebook (Rainie et al., 2013), but the percentage difference was small (74% versus 70%). Conversely, there were no sex differences in responses to more detailed questions about Facebook, either the amount of time per day spent on Facebook or the number of "friends," reported by a recent community sample of adults from 18 to 92 years of age (Van Volkom et al., 2013). Inconsistent reports may be due to the type of questions participants are asked about their Facebook use (Schwarz, 1999).

### **Sex Differences in Emotions Associated with Technology**

In contrast to the clear differences between generations, there are no clear sex differences in emotional outcomes of technology use. Some research has found that women tend to experience more anxiety than men (Czaja et al., 2006), whereas other researchers found no differences between males and females in the same year (e.g., Shedletsky, 2006). When looking into obstacles to using technology for older women, the two most commonly reported responses are experiencing anxiety and lacking confidence (Rosenthal, 2008). This indicates that the negative emotional reactions of users to technology may be severe enough to prevent them from using technology.

### **Sex Differences in Technology-Related Skills**

When considering the various skill and competency factors that come into play for a potential user of technology, sex differences emerge (Wang & Wang, 2010). Men are more concerned with how the technology will benefit them, whereas women are more concerned with

how much effort they will have to put forth when using the technology. Men and women also have different motivators for improving upon their technology-related skills. The most important motivating factors for older women to become computer literate include: to acquire information, to try something new, desire to stay current with the world, to keep in touch with family and friends, needing to use word processing, and to obtain health-related information. Sex differences have also been detected in perceived aptitude for technology (Smith, 2012). Specifically, males perceived themselves to have a higher technical aptitude than females, whereas females perceived themselves to have a higher aptitude for social technology than males (e.g., text messaging and Facebook).

### **Sex Differences in Attitudes and Perceptions of Technology**

Most research appears to agree that sex differences with respect to attitudes towards technology continue to exist (Czaja et al., 2006; Heinz et al., 2013; Sherman et al., 2000). In 2006, women reported having the least positive feelings and the most negative attitudes towards technology (Czaja et al.). Furthermore, men tended to feel more positively than women towards computers specifically (Sherman et al., 2000). With respect to Facebook usage, women not only use the site more often than men, but they also report valuing Facebook more than men (Heinz et al., 2013). These differences may be explained by variations in the degree that women value making connections with others, rather than a reaction to a type of technology.

### **The Present Study**

Research has yielded information about general demographic trends in the usage, perceptions, attitudes about, and skills related to technology within American mainstream culture. Technology usage is generally more prevalent in younger users (e.g., Czaja et al., 2006). Older adults and women tend to have more negative perceptions of technology than younger adults and men (Czaja et al., 2006; Purcell et al., 2012; Van der Kaay & Young, 2012). Additionally, older adults report experiencing more adverse emotional reactions to technology (Czaja et al., 2006; Rosenthal, 2008; Shedletsky, 2006; Van der Kaay & Young, 2012). Finally, older adults and women generally perceive themselves to have fewer technology-related skills (Czaja et al., 2006; Shedletsky, 2006; Van der Kaay & Young, 2012; White et al., 2002). Because many positive outcomes have been associated with technology (Cotton et al., 2012; Shapira et al., 2007; White et al., 2002) and more older adults are becoming users of technology (Lenhart et al., 2010), it is important to explore contexts that influence technology usage and perceptions within American culture. Furthermore, as more recent community data have



questioned the extent of sex differences (Van Volkom et al., 2013), it is important to determine whether the pattern of more age differences than sex differences is replicated.

The current study examines generational and sex differences among a community sample of younger, middle-aged, and older adults in the New York metropolitan area. This is accomplished by examining participants' demographics and attitudes towards, use of, and feelings about different types of technology. Participants also reported how technology influences different aspects of their social life. The present study adds to the current literature base by addressing many questions that have not been considered in previous research (e.g., feelings of frustration, addiction, and anxiety related to technology, using technology to avoid work, personal problems, or face-to-face communication, misunderstandings that result when using technology to communicate, and perceptions of the user-friendliness of computers, websites, and cell phones). The following hypotheses are tested:

*Hypothesis 1:* There will be sex differences in technology use.

*Hypothesis 2:* Younger generations will report being more comfortable using various forms of technology than older generations.

*Hypothesis 3:* Younger participants will report more feelings of anxiety when cut off from technology, and fewer feelings of frustration when using technology.

## METHOD

### Participants

The full sample included 276 adults. One participant was dropped for missing data on generation, 6 participants were dropped for missing data on age, and 7 participants were dropped for missing data on sex, since these were the key demographic variables of interest. The final sample of 104 men and 158 women ranged in age from 18 to 92 years ( $M_{\text{age}} = 49.21$ ,  $SD = 20.49$ ). Participants self-reported their generation according to their age group, resulting in 90 young adults (defined as 18 - 44 years of age;  $M_{\text{age}} = 25.12$ ,  $SD = 7.54$ ), 88 middle-aged adults (defined as 45 - 64 years of age;  $M_{\text{age}} = 51.81$ ,  $SD = 6.26$ ) and 84 older adults (defined as 65 years of age and older;  $M_{\text{age}} = 72.29$ ,  $SD = 6.52$ ). Almost half of the sample (123 participants) worked full-time, with 46 working part-time, 11 unemployed, 16 in school and not working, and 64 retired. Two participants failed to report their employment status.

Almost half of the sample (118 participants) was married, with 83 reporting single, 29 reporting divorced, 4 reporting separated, and 26 reporting widowed as their marital status. Two participants failed to complete the marital status item. When asked about educational status, 15 participants reported some high school education, 60 were high school

graduates, 79 had completed some college, 57 were college graduates, 10 attended some graduate school, and 39 held graduate degrees. Two participants failed to respond to this item. The majority of the sample (199 participants) was of White or European ancestry, with 8 reporting Eastern or Asian ancestry, 24 reporting Black or African ancestry, 21 reporting Hispanic or Spanish ancestry, 9 reporting another ancestry not listed on the questionnaire, and one participant failing to report ethnicity.

When asked about their living situation, most participants (209) reported living with someone else (such as a roommate or spouse) while the remaining 51 lived alone (and 2 participants failed to answer this item). Almost all participants (241) reported that they owned a cell phone, with only 14 reporting that they did not own a cell phone (7 participants did not respond to this item). More than half of the sample (161 participants) reported that they used both a landline and a cell phone in their primary residence, while 22 used a landline only and 77 used a cell phone only. Two participants failed to respond to this question.

Participants were recruited via convenience samples in the community as well as the family, friends, and acquaintances of the students in two sections of a Research Methods in Psychology and Laboratory course from summer 2012 and summer 2013. The student research assistants obtained written consent for participation after reading the informed consent form to the participants.

### **Materials**

The questionnaire, containing 43 items and designed for the purposes of this study, obtained general demographic information (e.g., generation, marital, educational, and employment status, and ethnicity). Participants responded to questions such as their frustration level when using technology (e.g., “how much frustration do you feel when using technology?”, where 1 = *none*, and 7 = *a lot*). They also responded to technology use questions such as “do you ever use technology to help you forget about personal problems?”, where 1 = *never* and 7 = *all the time*, and “do you ever use technology to avoid work?”, where 1 = *never* and 7 = *all the time*. Participants also responded to perception questions such as “how user-friendly do you find websites to be?” where 1 = *not at all user-friendly* and 7 = *very user-friendly*. Participants were asked about their use of social media (e.g., “approximately how many friends do you have on Facebook?”). Participants also responded to questions about their use of Twitter, the Internet in general, and their use of a cell phone to make and receive phone calls as well as send and receive text messages during the week and on the weekend.

**Procedure**

During two six-week Research Methods summer courses, one in 2012 and one in 2013, student research assistants were trained on ethical standards of research and data collection for this project. Students were sent into the field to collect data via convenience sampling. Once informed consent was obtained from participants by the student researchers, the consent forms were filed separately. Participants were given privacy to complete the questionnaire, but the researcher remained close by to answer any questions and provide clarification as needed. Data were compiled across both summer sessions and were combined for the purposes of the current analyses.

**RESULTS**

See Table 1 for a summary of sex differences in general technology use in daily behavior, none of which reached statistical significance (e.g., amount of time spent on Facebook, Twitter, and the Internet, as well as weekday and weekend cell phone calls made and received and weekday and weekend text messages sent and received).

TABLE 1 Sex Differences in Technology Use

	Men		Women		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Weekday Cell Calls Made	13.07	18.10	11.15	19.88	.43
Weekday Cell Calls Received	10.86	16.09	7.75	11.50	.07
Weekend Cell Calls Made	8.44	9.87	7.93	14.40	.75
Weekend Cell Calls Received	13.00	53.76	8.60	25.54	.38
Weekday Texts Sent	46.25	89.43	74.94	263.79	.29
Weekday Texts Received	43.52	78.98	70.94	253.44	.29
Weekend Texts Sent	43.27	86.99	71.83	342.96	.41
Weekend Texts Received	47.02	92.16	58.23	258.13	.67
Hours per Day on Facebook	1.84	4.90	1.23	1.95	.17
Hours per Day on Internet	2.53	2.52	2.87	3.19	.37
Hours per Day on Twitter	.21	.99	.34	1.33	.41
Friends on Facebook	223.98	376.60	198.64	347.61	.58

A 2 (male versus female) X 3 (young adults versus middle aged adults versus older adults) ANOVA revealed a sex difference in ease of adaptation to new technology ( $F(1, 259) = 4.27, p = .04$ ) with males reporting greater ease of adaptation than females. There was also a significant main effect of generation in ease of adaptation to new technology ( $F(2, 259) = 38.79, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 5.69, SD = 1.48$ ) adapting more easily than both middle aged adults ( $M = 4.82, SD = 1.51$ ) and older adults ( $M =$

3.54,  $SD = 1.83$ ) and middle aged adults adapting more easily than older adults.

A 2 (male versus female) X 3 (young adults versus middle aged adults versus older adults) ANOVA revealed a sex difference in comfort with current technology ( $F(1, 258) = 7.04, p = .008$ ) with males reporting greater comfort than females. There was a significant main effect of generation in comfort with current technology ( $F(2, 258) = 36.13, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 6.07, SD = 1.24$ ) being more comfortable than both middle aged adults ( $M = 5.18, SD = 1.37$ ) and older adults ( $M = 4.05, SD = 1.86$ ) and middle aged adults being more comfortable than older adults.

Analyses of frustration when using technology revealed main effects for sex ( $F(1, 257) = 6.10, p = .014$ ) and for generation ( $F(2, 257) = 4.71, p = .01$ ). Females reported greater frustration than males. In addition, a post hoc Tukey's test revealed that older adults ( $M = 4.09, SD = 1.72$ ) reported more frustration than younger adults ( $M = 3.31, SD = 1.67$ ), with middle aged adults showing no significant difference in frustration level from the other two age groups.

Although there was no significant sex difference in feeling addicted to technology, there was a significant main effect of generation on self-perception of addiction ( $F(2, 258) = 29.57, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 4.42, SD = 1.77$ ) feeling more addicted to technology than both middle aged adults ( $M = 3.62, SD = 2.00$ ) and older adults ( $M = 2.25, SD = 1.64$ ) and middle aged adults feeling more addicted than older adults.

When asked how anxious participants would feel if they were out and realized they left their cell phone at home, there was no significant sex difference, but there was a significant main effect of generation on this attitudinal variable ( $F(2, 257) = 18.23, p < .001$ ). Again, a post hoc Tukey's test revealed that older adults were less anxious ( $M = 3.21, SD = 2.19$ ) than both middle aged ( $M = 4.89, SD = 1.76$ ) and young adults ( $M = 4.78, SD = 1.93$ ), with no significant difference found between young and middle aged adults.

When asked if technology had significantly altered communication with others, there was no significant sex difference, but there was a significant main effect of generation ( $F(2, 256) = 27.96, p < .001$ ). Again, a post hoc Tukey's test revealed that older adults were less likely to feel technology has altered communication with others ( $M = 3.89, SD = 2.05$ ) than both middle aged ( $M = 5.41, SD = 1.57$ ) and young adults ( $M = 5.76, SD = 1.64$ ), with no significant difference found between young and middle aged adults.

Analyses revealed a significant sex difference in the use of technology to avoid work ( $F(1, 257) = 4.57, p = .03$ ) with females being more likely to report using technology to avoid work than males. A significant main effect of generation was also found here ( $F(2, 257) = 37.20, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 3.81, SD = 1.98$ ) being more likely to report using technology to avoid work than both middle aged adults ( $M = 2.49, SD = 1.73$ ) and older adults ( $M = 1.56, SD = 1.13$ ) and middle aged adults being more likely to report using technology to avoid work than older adults.

A sex difference was found in using technology to help forget about personal problems ( $F(1, 260) = 4.47, p = .04$ ) with females being more likely to report using technology to help forget about personal problems than males. A significant main effect of generation was also found here ( $F(2, 260) = 15.24, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 3.68, SD = 1.86$ ) being more likely to report using technology to help forget about personal problems than both middle aged adults ( $M = 2.90, SD = 1.80$ ) and older adults ( $M = 2.20, SD = 1.72$ ) and middle aged adults being more likely to use technology to help forget about personal problems than older adults.

Although there was no sex difference in using technology to avoid talking with someone face-to-face, there was a significant main effect of generation here ( $F(2, 260) = 34.07, p < .001$ ). Again, a post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 4.20, SD = 1.74$ ) being more likely to use technology to avoid talking with someone face-to-face than both middle aged adults ( $M = 3.51, SD = 1.75$ ) and older adults ( $M = 2.09, SD = 1.48$ ) and middle aged adults being more likely to report using technology to avoid talking with someone face-to-face than older adults.

Although analyses revealed no sex difference in how often there are misunderstandings when communicating with technological means, there was a significant main effect of generation here ( $F(2, 259) = 23.27, p < .001$ ). Again, a post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 4.31, SD = 1.67$ ) being more likely to have misunderstandings when communicating via technological means than both middle aged adults ( $M = 3.54, SD = 1.77$ ) and older adults ( $M = 2.43, SD = 1.63$ ) and middle aged adults being more likely to have misunderstandings when communicating via technological means than older adults.

A 2 (male versus female) X 3 (young adults versus middle aged adults versus older adults) ANOVA revealed a sex difference in feelings

about the pace of technological advances ( $F(1, 259) = 4.35, p = .04$ ), with females feeling that the pace of technology moves faster than males do. There was a significant main effect of generation in feelings about the pace of technological advances ( $F(2, 259) = 3.53, p = .03$ ). A post hoc Tukey's test revealed that older adults ( $M = 5.57, SD = 1.51$ ) feel technology moves faster than young adults do ( $M = 5.02, SD = 1.27$ ). There were no significant differences between the middle aged adults and the other two age groups.

Analyses revealed no significant sex difference in how user-friendly participants found cell phones to be, but there was a significant main effect for generation ( $F(2, 260) = 18.88, p < .001$ ). A post hoc Tukey's test revealed older adults ( $M = 4.37, SD = 1.88$ ) view cell phones as less user-friendly than both middle aged adults ( $M = 5.34, SD = 1.21$ ) and young adults ( $M = 5.76, SD = 1.11$ ). There were no significant differences between young and middle aged adults in perceptions of the user-friendliness of cell phones.

ANOVA's revealed no sex difference in perceptions of the user-friendliness of computers in general, but there was a significant main effect for generation ( $F(2, 260) = 20.54, p < .001$ ). A post hoc Tukey's test revealed that all three generations were significantly different from each other, with young adults ( $M = 5.60, SD = 1.14$ ) finding computers more user-friendly than both middle aged adults ( $M = 5.05, SD = 1.29$ ) and older adults ( $M = 4.07, SD = 1.97$ ) and middle aged adults finding computers more user-friendly than older adults.

A 2 (male versus female) X 3 (young adults versus middle aged adults versus older adults) ANOVA revealed no sex difference in perceptions of the user-friendliness of websites, but there was a significant main effect of generation ( $F(2, 259) = 27.33, p < .001$ ). A post hoc Tukey's test revealed that older adults ( $M = 3.74, SD = 1.96$ ) find websites less user-friendly than both middle age adults ( $M = 5.09, SD = 1.34$ ) and young adults ( $M = 5.38, SD = 1.11$ ). There was no significant difference between young and middle aged adults' perceptions of the user-friendliness of websites.

## DISCUSSION

Since generation, or age, has been found to be a more important predictor of use of technology than sex in a recent community sample (Van Volkom et al., 2013), this trend was tested in the current study by assessing sex and age differences across various indices of technology use. No support was found for the hypothesis that there would be sex differences in technology use. Consistent with the trend of diminishing sex differences in reports of use of technology, there were no sex differences in technology use in the twelve daily behavior measures in

the current sample. These included cell phone use, texting, time on Facebook, the Internet, and Twitter, and number of friends on Facebook. These data also contradict earlier researchers (e.g., Sherman et al., 2000) who suggested that sex differences in the use of technology have persisted into the twenty-first century. Sex differences appear to be diminishing in the second decade of the century, at least among those in the New York metropolitan area.

In contrast to the self-report data concerning how much they use technology, sex differences in the self-report of attitudes toward technology have persisted. Women reported more frustration when using technology, and more likelihood that they would use technology to avoid work or forget about personal problems. The latter two findings may be more indicative of a sex difference in avoidance as a coping strategy than in overall attitudes toward technology. The women in the current sample also reported feeling that the pace of technology moves faster than males felt that it does, which could indicate more anxiety (e.g., Czaja et al., 2006) about the pace or more enthusiasm about it. More research is needed to assess the valence of this finding, but taken together with women's reports of less ease of adaptation to new technology and less comfort with current technology, it appears that rather than sex differences in the overall use of various types of technology, it is sex differences in attitudes toward it that persists.

In contrast to the previous recent findings (Van Volkom et al., 2013), there were no significant age and sex interactions revealed in the current study. The age differences revealed here are all independent of sex of participant and generally characterized by significant differences among all three age groups. Age differences across all three groups in the predicted direction were found for ease of adaptation to new technology, comfort with current technology, feeling addicted to technology, using technology to avoid work and to forget about personal problems, and to avoid talking with someone face-to-face. All three age groups also differed in the predicted direction in reporting misunderstandings when communicating with technological means. These results mirror previous research findings that older adults generally have more difficulty with technology than their younger counterparts (Heinz et al., 2013; Rosenthal, 2008; Shedletsky, 2006).

When the age differences are not found across all three age groups, the trend is for the oldest group to be the outliers. They are more frustrated when using technology, less likely to view cell phones and websites as user-friendly, and more likely to feel that the pace of technological innovation moves too fast. Older adults are also less anxious if they are out and realize that they do not have their cell phone

and less likely to feel that technology has altered communication with others.

Overall, the data reported here are consistent with the hypothesis that the oldest adults are less comfortable using various forms of technology than the younger age groups. The hypothesis that the younger adults would be more likely to experience anxiety when out without their cell phones, and less likely to experience frustration with technology, was also supported.

These data have important implications in an era when older adults are a large and increasing proportion of the American populace. Firms that want to retain or attract older workers may need to provide them with training in using new technology. These data also have implications for the social worlds of older adults, as younger adults engage in more technology-based communication. Many groups, from condominium associations to religious congregations and other non-profit organizations, have transitioned to primarily using electronic communication, thus it is important to understand that the oldest adults in the group may be less likely to be included in this type of exchange.

There are a few noteworthy limitations. First, given that there were numerous student assistant researchers, there may have been procedural inconsistencies. Second, some participants found the questionnaire to be too lengthy, leading to some missing data, especially in the demographic section. In addition, there are other types of technology/social media sites/cell phone applications that were not included in this study; their use should be addressed in future research with different generations of adults (e.g., Instagram, Snapchat, YouTube).

Future research is also needed to test the generality of the current study's trends in rural areas, as opposed to the metropolitan area where these data were obtained. These data suggest that at least in metropolitan areas, the "digital divide" is between the oldest adults and the rest of the population, rather than between the sexes. Consistent with Rosenthal (2008) and Shedletsky (2006, 2012), programs of individual instruction from mentors are suggested to increase elders' comfort with and competency with technology. Since increased use of technology among the elderly has been demonstrated to be associated with life satisfaction and sense of control (Shapira et al., 2007) and lower levels of depression (Cotton et al., 2012), developing programs for technology mentoring in the community is suggested.

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*Note.* Weekday and weekend cell phone calls made and received, weekday and weekend texts sent and received, hours per day on Facebook, Twitter, and the Internet in general, and friends on Facebook were answered in an open-ended format.

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