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Using a Quasi-Experimental Study to Examine Program Participation and Outcomes for Older Adult Intergenerational Technology Program Participants

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Using a Quasi-Experimental Study to Examine Program Participation and Outcomes for Older Adult Intergenerational Technology Program Participants

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Abstract (100 words):
To extend the literature on participation in intergenerational technology programs, we conducted a quasi-experimental study consisting of senior center participants, half who took part in the University of Rhode Island Engaging Generations Cyber-Seniors (URI eGen Cyber-Seniors) Program and half who did not. Findings showed that both groups were similar on most variables; however participants did have higher education levels and more positive attitudes towards younger people. We also examined if older adult program participants improved scores on social and technological measures compared to the control group, and we found participants improved on technology use, digital competence, loneliness, and doing unpaid community service measures but not the non-participants.

Key words:
Intergenerational technology program, quasi-experimental design, senior centers, social isolation, loneliness, social engagement, digital competence

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Abstract

To extend the literature on participation in intergenerational technology programs, we conducted a quasi-experimental study consisting of senior center participants, half who took part in the University of Rhode Island Engaging Generations Cyber-Seniors (URI eGen Cyber-Seniors) Program and half who did not. Findings showed that both groups were similar on most variables; however participants did have higher education levels and more positive attitudes towards younger people. We also examined if older adult program participants improved scores on social and technological measures compared to the control group, and we found participants improved on technology use, digital competence, loneliness, and doing unpaid community service measures compared to the non-participants.

Introduction

In response to demographic and societal changes and to address ongoing ageism in society, intergenerational programs have emerged. Engaging older and younger generations in meaningful activities to foster their connection and cooperation helps to bridge the generation gap (Jarrott et al., 2022; Newman, 1997). The activities may vary across programs, but the basis of activities remains the same-- to connect generations in meaningful ways. The focus of this study is the University of Rhode Island (URI) program that uses technology as a medium to bring college students and older adults from the community together for mutual benefits. A greater description of the program can be found elsewhere, which includes justification on our interdisciplinary service learning, intergenerational, and reverse mentoring approach (Leedahl et al., 2018). The general idea is that the program helps prepare future health and human service

professionals (i.e., university students) for working with the aging population and enhances technological competence and social connectedness for older adults.

Much research on intergenerational programs shows their value for both older and younger generations, and emerging literature shows promise for intergenerational technology programs in particular (Othelia & Kim, 2019). Among these programs, older adults report decreases in social isolation (Cotten et al., 2013) and loneliness (Choi et al., 2012; Lee & Kim, 2019), more interest in using technology (Lee & Kim, 2019, Leedahl et al., 2018), and more positive attitudes towards younger generations (Meshel & McGlynn, 2004). Studies of the impacts on younger generations have found such programs can lead to reduced ageism and more positive attitudes towards older adults and aging (Kassab & Vance, 1999; Kim et al., 2019; Leedahl et al., 2020).

However, a closer look at the existing literature evaluating intergenerational programs reveals a number of shortcomings and gaps that the present study worked to address. First, existing literature mostly examines participants who self-select into programs. In the present study we investigated demographic and social differences between participants and non-participants to shed light on which older adults choose to take part in intergenerational technology programs. In addition, a unique contribution of our study is a measure of older adults' attitudes towards young adults. Second, limited research has utilized experimental design to examine older participants in intergenerational programs. For the most part, studies that use control and experimental groups focus on younger participants, or a mixture of younger and older generations. Our study, however, included a comparison group of older non-participants from the same senior centers as the program participants.

The purpose of this quasi-experimental study was to examine older adult participant characteristics and pre/post outcomes for social integration, digital competence, and technology use among community-residing older adults participating in the URI eGen Cyber-Seniors Program at senior centers in the state. There are two research questions: 1) Who were the older adults who chose to participate in an intergenerational technology program compared to non-participants? 2) Did the program improve outcomes (social integration, technology use, digital competence) for older adult participants between the pre- and post-survey when compared to non-participants?

Using Experimental Designs

To our knowledge, little research has examined differences in characteristics of older adults who chose to participate in intergenerational programs compared to a similar group of older adults who did not participate. Though not the main focus of the study, one study found participants who self-selected into intergenerational technology programs were more likely to be married compared to non-participants (Marx et al., 2005). Furthermore, some work has examined senior centers and healthcare interventions. Pardasani (2010) analyzed demographic differences between senior center participants and non-participants. In this study from Indiana, senior center participants were most likely to be single, widowed, or never married, live alone, female, have incomes less than $25,000, and generally be in better health than non-participants. Results also found older adults who are African American or Hispanic/Latino were less likely to participate in senior centers than older adults who are White/Caucasian. Research studies in other areas, such as healthcare, have investigated demographic characteristics of older adults related to their intervention participation. For example, previous studies on digital health technologies find that older adult participants tend to be younger, have higher education, report better quality of life

and health overall, access technology more frequently, and have better digital skills than older adult non-participants (Poli et al., 2019; Poli et al., 2020). Overall, these studies suggest that there are demographic differences among older adults who participate in senior centers, digital technology research, and intergenerational programs and those who do not.

Most research evaluating intergenerational programs use one group pre/post test designs (Delello & McWhorter, 2017; Feyh et al., 2021; Hegeman et al., 2010; Isaki & Harmon, 2015; Martins et al., 2019; Park et al., 2016), and most have shown positive results. However, a systematic review in 2017 found that only 50 of 284 articles focused on this topic established the effectiveness of intergenerational programs by using experimental or quasi-experimental designs with a control or comparison group (Canedo-García et al., 2017). Because many of the studies lack internal validity without a control or comparison group, these programs are unable to infer causality (Rubin & Babbie, 1989). Similarly, a 2019 systematic review on intergenerational programs evaluated 16 studies, and two used a control group (Chase, 2010; Jarrott & Smith, 2011) and almost half of the studies used pre/post test designs (Martins et al., 2019). Chase (2010) utilized a comparison group study (n=20) composed exclusively of younger generations while the comparison group study from Jarrott and Smith (2010) consisted of both mostly younger (n=45) and some older participants (n=14).

Older Adult Attitudes Towards Younger Populations

A series of studies have evaluated differences in older adults' attitudes towards younger generations following participation in intergenerational programs (Belgrave, 2011; Gamliel & Gabay, 2014; Kranz et al., 2021; Meshel & McGlynn, 2004; Pinquart et al., 2000; Sun et al., 2019). Results from each of these studies showed older adult participants reported significantly more positive attitudes towards younger generations after participation. Moreover, four of the

studies included some type of older adult control or comparison group, and these studies showed positive changes for older adults in the intergenerational program compared to those in the comparison group (Belgrave, 2011; Kranz et al., 2021; Pinquart et al., 2000; Sun et al., 2019). It is important to note that these studies focused on children (Belgrave, 2011; Gamliel & Gabay, 2014; Meshel & McGlynn, 2004; Pinquart et al., 2000) and adolescents (Kranz et al., 2021; Sun et al., 2019) but not traditional college-aged young people. Therefore, it is unknown if older adults' attitudes towards younger participants vary by the age of the younger participants' (i.e. college age vs middle childhood). However, one intergenerational program identified positive changes in older adult attitudes towards younger college-aged individuals using qualitative methods (Breck et al., 2018). In addition, prior research has not examined whether attitudes towards younger people may influence voluntary participation in programs.

While there is a lack of research on older adult attitudes towards young adults in intergenerational programs, a related body of research has examined ageism towards younger populations, including children, young adults, and middle-aged people (de la Fuente-Núñez et al., 2021). In their scoping review, de la Fuente-Núñez and co-authors found that most research on ageism focuses on ageism towards older adults. However, a major study of European populations found that both young adults and older adults report greater experiences of age-based discrimination, in comparison to middle adulthood (Bratt et al., 2018). Research has also found that younger and older people rely on age stereotypes in interpersonal relationships (de la Fuente-Núñez et al., 2021; Matheson et al., 2000).

Research findings relating to older adult views of younger people are mixed, with some studies suggesting older adults prefer younger people, while other studies have found neutral or negative views (de la Fuente-Núñez et al., 2021). The scoping review also highlighted that there

is insufficient research on ageism towards youth in educational settings. Clearly more research is needed. Although some of the existing evaluation research found positive attitudinal changes towards younger persons (e.g., children, adolescents) among older adults, there is a lack of research specifically related to intergenerational programs with young adults. Therefore, this study aimed to fill this gap by analyzing differences in attitudes towards younger people between older adult participants in an intergenerational program compared to a similar group of older adults who did not participate. Knowing more about this could help to inform participation in future intergenerational interventions and programs.

Benefits of Intergenerational Technology Programs

According to the first scoping review on technology-based intergenerational programs, fostering intergenerational connections through technology is an emerging field, and much of the research on intergenerational technology programs have found positive results related to improving older adults' confidence with using technology (Reis et al., 2021). Similar to the program in the current study, the Intergenerational Mentor-Up (IMU) program engaged older adults and college students in student-led one-on-one technology training sessions. In their evaluation of this program, Lee and Kim (2019) found significant increases in older adults' interest, self-confidence, and self-efficacy in using computers/internet as well as their willingness to learn how to access online health information. Moreover, older adults' perceptions about the importance of having the ability to access online health resources and the Internet's usefulness in helping make health-related decisions became significantly more positive from pre- to post-intervention (Lee & Kim, 2019). Lee et al. (2022) found that confidence using computer technology significantly improved among older adults with technophobia participating in the Intergenerational Forum intervention.

Findings about psychosocial outcomes for older adults (e.g., loneliness, depression) of intergenerational technology programs remain mixed. Lee and Kim (2019) found that older adults' feelings of loneliness significantly decreased; yet, there were no differences in their perceived social support. Another technology intergenerational program found no significant difference in overall loneliness from pre- to post-intervention (Mullins et al., 2020). However, older adult participants were significantly less likely to agree with the statement "There is no one I can turn to," after program participation (Mullins et al., 2020). Gamliel and Gabay (2014) found significant increases in older adults' self-confidence, self-efficacy, and communal involvement following participation in the Israeli Multigenerational Connection Program (MCP). In a recent study conducted during the pandemic, Juris et al. (2022) found improvement in loneliness for older adults following participation in a virtual intergenerational program. Therefore the present study aims to contribute to the existing literature by analyzing change in loneliness and social integration variables among older adult participants (the experimental group) and non-participants (the control group).

Conceptual Framework

There are a number of theories that guide this program and this study specifically. The Knowles' (1984) theory of andragogy, which has been used previously to conceptualize how to teach older adults to use technology (Fink & Beck, 2015), is a constructivist approach to learning, grounded on the notion that adults draw from their own knowledge and experiences to learn. In addition, adults' readiness to learn is strongly related to the relevance of the subject matter to their own lives (Teaching Excellence in Adult Literacy, 2011). Building on Knowles' theory of andragogy, this program also utilizes concepts from Zygotsky's theory of sociocultural learning, which emphasizes the importance of social interaction between individuals and on

finding people's zone of proximal development (ZPD) when learning. The idea is that there is some information that people already know or that they can learn on their own, but there is also information that is in the ZPD – the tasks and information an individual can learn and perform with the help of a more capable or knowledgeable person (Vygotsky & Cole, 1978). In other words, individuals can learn more with the help of someone, such as a mentor, than they can on their own. This information is also summarized in Table 1 below. We hypothesized that participants in the program would have more positive attitudes toward younger people, thus seeing them as capable and knowledgeable, compared to non-participants.

Similar to literature on other intergenerational programs (Martins et al., 2019), we also utilized Contact Theory to help explain the importance of building the relationship between the student mentors and older adult participants as a way to build trust and confidence. The tenets of Contact Theory include: equal group status, intergroup cooperation, common goals, support from authority figures, and opportunity for friendship (Allport, 1954; Pettigrew, 1998). The idea is that when these conditions are met, interpersonal contact can positively affect attitudinal change and reduce discrimination and prejudice among members of different generations (Jarrott & Smith, 2011; Martins et al., 2019). Because our program addresses these tenets, we hypothesized that participants in the program will have more positive technological and social outcomes compared to non-participants. See Table 1 for a description of the theoretical tenets and descriptions of how our program addresses each tenet.

[Insert Table 1 about here]

Program Description

The URI Program is an interdisciplinary, intergenerational program that teaches older adults about technology and helps them use technology for enhancing social and community

connections. The URI eGen Cyber-Seniors Program uses reverse mentoring and a service-learning approach, where university students help older adults learn about technology for experiential education, while developing communication and teaching skills. We partner with community organizations, mostly senior centers, to implement this program. During the time period of this study, we placed students at the four senior centers, and students would help older adults during one-on-one appointments.

Study Aims

The present study has two research aims: 1) to examine similarities and differences between participants and non-participants of an intergenerational technology program held at senior centers; 2) to utilize quasi-experimental design to assess program outcomes. This study included 50 older adults from four different senior centers in Southern Rhode Island. We utilized a quasi-experimental design because respondents self-selected to participate or not in the program, as opposed to a random assignment that would be used for a true experiment.

The first research aim examines differences between participants (experimental group) and non-participants (control group) in their demographics, technology use, digital competence, attitudes towards young people, and social integration measures. For this aim we compared characteristics between participants and non-participants using pretest measures. The second research aim uses a quasi-experimental design to identify changes in technology use, digital competence, and social integration measures for participants in the program compared to non-participants. For this aim, we analyzed pre- and post-test differences in the measures for each group.

Methods

This study took place over three semesters and ended during the Spring 2018 semester. We worked with four senior centers in Southern Rhode Island that serve similar demographic populations of older adults (see Table 2 for a distribution across the four sites). We identified 25 senior center participants taking part in the URI eGen Cyber-Seniors Program who completed at least three technology support sessions with a university student mentor. These individuals took a pre-survey before taking part in any sessions, and they took a post-survey after their third session, which was generally 4-6 weeks after their first session. We also identified 25 active senior center participants who did not take part in the URI eGen Cyber-Seniors Program. These individuals took the pre-survey, and then completed the post-survey about 6 weeks later. All participants received a $5 gift card for completing the pre-survey, and $15 gift card for completing the post-survey; both surveys were paper and pencil. A student researcher introduced the survey to the potential participants, and the participants answered the questions on their own, though the student researcher was available to answer any questions. Once the hard copies of the surveys were collected, all data was entered into Survey Monkey, which was then converted to SPSS files for data cleaning and analysis. Subsequent analysis was carried out in STATA.

[Insert Table 2 about here]

Measures

The pre- and post-surveys included demographic questions, a question about attitudes toward younger people, and items pertaining to social integration and technology use. Social integration is defined as the degree to which people are connected to others and to their communities (Leedahl et al., 2015; Hooyman & Kiyak, 2011).

Demographics

For demographics, participants responded to a series of questions. The information gathered included: age (calculated from date of birth), gender (male, female), primary language used (English; other), race (White; People of color), relationship status (married/partnered; widowed; divorced; single), employment status (works full time; works part time; unemployed; retired), living arrangement (lives alone; with others), income (more than $30,000 per year; less than $30,000), and education (HS or less; college or more).

Attitudes towards Younger People

To assess attitudes toward younger people, all participants were asked to fill out an open-ended question: Complete the following sentence with your thoughts about the current generation of young people, “Young people are _____.” These qualitative phrases were then evaluated by three independent coders whether the phrases/words were coded as positive, negative, or neutral (neither positive nor negative, or a mix of the two). The coders were three gerontology faculty members. Participants’ responses included positive phrases such as "strong and amazing" and negative phrases such as "for the most part are not what made America great." This measure was derived from the Burbank et al. (2006) approach for assessing attitudes towards older adults. The three coders had a Krippendorf’s alpha of 0.95. Following Young and Soroka’s (2012) approach, the scores from the three coders were arranged on a 5-point scale. When all three agreed that the phrase was negative, the score was coded as 1. When two of three coders said negative, it was coded as a 2. When two or more coders said neutral it was coded as a 3. When two of three coders said positive, it was coded as a 4. When all three coders said positive it was coded as a 5.

Technology Use

The technology measures were developed in consultation with program developers and after reviewing existing measures. To examine technology use, we asked respondents how frequently they use the following technological devices: 1) desktop computer; 2) laptop computer; 3) tablet (e.g., iPad, Kindle); 4) Smartphone (e.g., iPhone, Android); 5) other. For each of these survey items, response choices were: 1) daily; 2) weekly; 3) monthly; 4) never. We examined "technology usage" by calculating the average across the five questions for technology use (range 1-5). We also included an index of technological diversity: how many different devices (including desktop, laptop, tablet, smartphone, and other) they reported using at least monthly (range 0-5).

Respondents were also asked about the purposes for which they use technology including: 1) email; 2) social media (Facebook, Twitter); 3) watch videos (YouTube); 4) video conferencing (Skype, FaceTime); 5) search the internet; 6) online banking or paying bills; 7) shopping. Response choices were yes or no. Using these responses, we created an index for the number of "purposes for technology" in which they use technology (range 0-7).

Digital Competence

To assess for digital competence, respondents were asked how much they felt competent with the following: 1) searching and finding information about goods and services; 2) reading and downloading files; 3) obtaining information from public authorities or public services; 4) seeking health information; 5) sending and receiving emails; 6) using video calls such as Skype; 7) posting messages on social networks; 8) sharing my interests/ideas with those I know; and 9) using copy/paste tools. Response choices ranged from strongly agree (1) to strongly disagree (4). This measure was derived from the suggested indicators for digital competence (European

Commission, 2014). We created a "digital competency" scale by calculating the mean score for all the competency skills reported. Lower scores indicated greater self-rated competence (alpha = 0.95 (pre) and 0.91 (post). Separately, we treated the items as binary variables (agree versus not) and summed them to create a digital skills index. This ranged from 0 to 9.

Social Isolation

To assess social isolation, participants completed the Lubben Social Network Scale-6 (LSNS-6), which includes three questions that evaluate family ties and another three questions that evaluate friendship ties on a scale from 0 (none) to 5 (nine or more) (Lubben et al., 2006). The six questions are summed to create a total social network score (higher scores indicate less isolation), with scores ranging from 0 to 30 (alpha = .87). The three items about family are summed to construct a LSNS-6 Family subscale, with scores ranging from 0 to 15(alpha = .92). Similarly, the three friendship items are summed to create a LSNS-6 Friendship subscale, with scores ranging from 0 to 15 (alpha = .87).

Loneliness

To assess loneliness, participants answered three items from the Campaign to End Loneliness (2014) Measurement tool rated from 0 (strongly agree) to 4 (strongly disagree). The three items are summed to create a total score scale where higher scores indicate more loneliness (range 0-12; alpha = .96). We also examined each item separately: content with relationships; comfortable asking for help; and relationships are satisfying.

Social Engagement

The social engagement measure used in this study was derived from Glass et al. (2006) in which older adult participants were asked about how often they participate in nine activities: (a) unpaid community services or volunteer work, (b) paid community work, (c) taking courses or

participating in discussion groups, (d) going to a movie, restaurant, or sporting event, (e) participating in social and community groups, (f) talking on the phone, (g) visiting friends, (h) attending group exercise activities, and (i) corresponding with friends and family on the internet. Responses were rated on a scale from 1 (never) to 4 (often), and the nine items were averaged to construct a single summary index (higher scores mean more engagement; alpha = .75). We also examined each item individually.

Analysis

In this study our first research question (aim 1) investigated whether there are differences between individuals who chose to participate in the URI eGen Cyber-Seniors Program and those who did not. In aim 1, for nominal variables we compared scores from the pre-surveys between participants and non-participants using cross-tabulation (chi-square test) analysis. For ordinal and interval/ratio variables we carried out two-sample Wilcoxon rank-sum (Mann–Whitney) tests. We did this rather than using independent samples *t*-tests because of the small sample size.

The second research question (aim 2), examined whether scores on technology use, digital competence, and social integration improved from pre-to post-survey for program participants (the experimental group) versus non-participants (the control group). For aim 2, we conducted Wilcoxon signed rank tests to analyze differences in pre- and post-test scores for each group. We hypothesized that differences would be significant for many of the variables for the experimental group, and we would not pick up on changes over time for the control group. Based on sample size, we used an alpha of $p<.05$ to establish statistical significance and $p<.10$ to establish marginal significance. Analysis was carried out using STATA 17.0.

Results

Comparison of Program Participants and Non-Participants (Aim 1)

Overall findings showed that the participant and non-participant groups were similar in terms of age, gender, language, relationship status, work status, and income. Differences were found, however, in terms of education level and attitudes towards young people (see Table 3). Those who chose to participate in the URI eGen Cyber-Seniors Program were also more likely to have graduated college (Mann-Whitney test z=2.33, p=.02). Further, participants were much more likely to have positive views towards young people (M=4.21, p=0.01) compared to non-participants (M=2.77). Based on these findings, being more educated and having an interest in interacting with younger people may have motivated older adults to participate in this intergenerational program. Given that the URI eGen Cyber-Seniors Program is an intergenerational reverse mentoring program where individuals self-select to participate, these factors may have motivated people to sign up.

[Insert Table 3 about here]

We also compared pre-survey scores for participants and non-participants on social integration, technology use, and digital competence measures. Respondents were similar across groups (not statistically significant) with regards to social isolation, loneliness, and social engagement. One exception was that for the "visiting friends" item, participants rated themselves a mean of 3.56 (on a 4 point scale) compared to 3.00 for non-participants (p<0.05). This means that they reported more frequently visiting with friends. For technology use and digital competence, no significant differences were found between the two groups. This supports the idea that these are equivalent groups at the pre-test for our key outcome measures – social integration, technology use, and digital competence. The fact that the two groups are very similar

at the beginning of the study made them suitable for the Aim 2 quasi-experimental design analysis.

Changes in Technology and Social Integration (Aim 2)

Table 4 presents pre- and post-survey scores for technology usage and digital competence variables. For all variables, no changes in scores were observed for the control group. For the experimental group that participated in the URI eGen Cyber-Seniors program, significant improvements in many technology usage and digital competence measures were observed. We documented marginally significant increases in average technology usage across all devices and number of devices used. However, we did see large increases in the frequency of using tablets, the index for the number of purposes in which they use technology, the overall digital competence scale, and the digital skills index. In examining individual items within digital competency, program participants reported greater confidence in their abilities to search and find information; read and download files; obtain information; seek health information; and send/receive emails.

[Insert Table 4 about here]

Table 5 presents pre- and post-survey scores for the social integration variables. For program participants, we observed improvements in loneliness, doing unpaid community service or volunteer work, and talking on the phone, but we did not identify significant improvements for the social isolation measures. In addition, the social engagement scale indicated marginally significant improvement indicating greater engagement over time. Overall, all scales and items showed positive change over time, though as indicated not all were significant.

As expected, for the control group, nearly all variables showed no change between the pre- and post-surveys. One exception was a statistically significant increase in reported going to a movie, restaurant, or sporting event.

[Insert Table 5 about here]

Discussion

In this study we used a quasi-experimental design to analyze the effectiveness of the URI eGen Cyber-Seniors Program. Giving strength to our experimental design, respondents in both groups were very similar. Two exceptions were that the experimental group had higher education levels than the control group. In addition, those who opted in to the program had much more positive attitudes towards young people. Levels of technology usage and digital competence were similar across the two groups, so lack of technology skills does not seem to be what motivated the experimental group to participate. These similarities between groups are a strength of this study, as other studies with comparison groups have found significant differences between groups (Czaja et al., 2018).

The second aim of our study compared scores from pre- to post-tests. We found participation in the program improved in digital competence and increased technology usage. For the control group however, no changes were observed. For program participants, loneliness decreased and volunteering increased. While few social integration measures showed statistically significant differences over time for the experimental group, there was virtually no change at all on these measures for the control group.

While older adults have shown to be the fastest growing computer and internet users in both personal and workplace matters (Wagner et al., 2010), the reality is that many older adults have struggled to gain access to technological devices, the internet, and/or the necessary skills to

fully use technology. Due to these issues, some older adults face digital exclusion, which is particularly problematic due to society's increased reliance on technology for healthcare, health information, and public health resources (Betts, et al., 2019). Some of the barriers to technological use for older adults include perceived lack of benefit, lack of interest or motivation, lack of knowledge, lack of access, cost, fear of hardware being outdated quickly, and perceived barriers due to physical limitations (Wagner et al., 2010). Research into the technological need of older adults found that people have interest in gaining more skills and prefer to gain knowledge through personalized one-on-one sessions that are relevant to their needs and help to build confidence (Betts et al., 2019). Based on the literature and the present study's findings, programs that help to remove barriers to technology use and provide assistance through personalized, one-on-one sessions should be continued and further implemented in order to reach increasing numbers of older adults, particularly those who are disadvantaged. Further, older adults with less education may need additional support (e.g., to ensure they feel included) to aid with participation in these types of programs.

While this study found evidence of decreased loneliness among intergenerational technology program participants, similar to the recent Juris et al. (2022) article, social isolation was not significantly reduced. Another technology intergenerational program found no significant difference in overall loneliness from pre- to post-intervention (Mullins et al., 2020). However, older adult participants were significantly less likely to agree with the statement "There is no one I can turn to," after program participation (Mullins et al., 2020). Though not an intergenerational program, Neil-Sztramko et al. (2020) found no differences in social isolation, social support, or loneliness among older adults after participating in a tablet training workshop. As previously discussed by Bixter et al. (2018), this study found increased social engagement via

volunteerism following participation in the program similar to our study. We hypothesize that we did not detect social isolation changes due to the sample being not overly economically disadvantaged. Previous research has suggested being low income is a potential risk factor social isolation (Nicholson, 2012). Social isolation scores were already quite high on the pre-survey for this sample, which is possibly a function of their economic status and the fact that all participants engage with their local senior centers, so while improvements were detected, it was not enough of a change to be statistically significant.

Policy and Practice Implications

The COVID-19 pandemic amplified the need to improve technological adoption among older adults, particularly among lower income populations. Without access to technology in some capacity, individuals are truly missing out on opportunities for engagement and information that could be critical to avoiding social isolation or meeting health needs. Due to this, the Aging and Disability Resource Center/No Wrong Door Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2019 funding included provisions that states could utilize for providing critical access functions such as improving digital access and addressing social isolation among older adults (Administration for Community Living, 2020; ADvancing States Aging and Disabilities Technology Workgroup, 2019). Some states (e.g., New York, Georgia, California, Rhode Island) have used the funds to develop initiatives that provide a combination of devices, internet, and technology training. Future research on these initiatives will shed light on the implementation of these programs and their impact on technology use and social isolation.

While both the experimental and control groups in the study were equivalent on technology and psychosocial measures, the differences in attitudes towards younger people provide opportunities for policy and macro-level intervention. For example, the AARP Disrupt

Aging initiative works to help younger people break down stereotypes of older people and empower older people to shift their own attitudes, behavior, and beliefs about aging. While the initiative recognizes ageism across the ages, the focus is on ageism towards older people. Based on our findings, we suggest an enhanced effort towards addressing ageism towards younger adults as well (sometimes called youthism or adultism), which can lead younger people to feeling powerless, disrespected, and dismissed (Bertrand et al., 2020). For example, in 2016 AARP created a powerful video entitled, "Millennials Show Us What 'Old' Looks Like," in which younger adults are introduced to older people after stating their initial biases towards what older adulthood means to them (e.g., starts in the 50s) and how it looks (e.g., people hunched over & slow). This is a very powerful video, utilized as part of Disrupt Aging initiatives and probably many gerontology classrooms across the globe, that challenges younger people's views. AARP could create a similarly powerful video to challenge older people's negative views of younger people and potentially show the harmful effects of thinking negatively about younger generations. If older adults have negative attitudes towards younger people, learning new information can be prohibitive. For example, if older adults encounter younger healthcare professionals (e.g., doctors, nurses), they might not believe these professionals know what they are talking about, which might prevent them from receiving the most evidence-based care or the latest treatment. Furthermore, older adults could potentially be missing out on education opportunities that many younger people may be offering or teaching (e.g., arts, theater, music), and all of this has been shown to have cognitive benefits (Fong et al., 2021).

Based on our experiences in implementing this program and completing this study, we have a number of practice implications for programs to consider. First, identifying the "ideal dose" at which to include someone as a research study participant when they are part of a

program that operates with one-on-one, individually-scheduled meetings needs to be considered. Other research also suggests this to be an area not fully examined within intergenerational programs (Krzeczkowska et al., 2021); however, previous research has shown that three intergenerational sessions can be successful (Andreoletti & Howard, 2018). This can be challenging for programs that want to complete an evaluative research study to examine participant outcomes, but do not have an established number of sessions that all participants must complete. After implementing our program for multiple semesters, the PI conversed with multiple students and asked the students to suggest the ideal number of sessions before people tend to feel quite comfortable and confident with their new technological skills or a point at which changes could be detected in levels of social isolation or loneliness. Obviously there was variation in responses, with some people only needing one session to get their questions answered and some people needing weeks of sessions. However, three sessions was mentioned by most students as an ideal number for most participants, so that is why we determined three sessions to include participants in this study. Other programs could utilize a similar protocol, ideally utilizing implementation research methods.

Limitations & Future Research

Some limitations of our study are worth mentioning. The data was collected in 2017 and 2018 prior to the COVID-19 pandemic, so this needs to be considered when interpreting the findings. Due to the small sample size, we were unable to perform more complex statistical analyses, such as multiple regression to control for confounding factors. This was a quasi-experiment, where participants self-selected into the program, so while the two groups of participants were largely similar other than two key variables mentioned above, there may be additional ways that the two groups differ from each other. These unaccounted variables could

then systematically influence the findings of our study, such as personality measures. In addition, our study did not find statistically significant relationships between program participation and social isolation, and this may be due to the small sample size or needing better measures of social integration. Finally, the PI is involved in implementing the program and leading the research efforts; however, to mitigate against any potential biases, other researchers are involved with and lead the data analysis efforts.

For future research, work is needed to understand the influence of intergenerational technology programs on disadvantaged populations of older adults, ideally including lower income older adults and racially and ethnically diverse older adults. Furthermore, based on this study's finding related to volunteering, this is an area worth examination to further understand how technology fosters social and civic engagement among older adults. Future research on intergenerational programs should also collect and analyze pre and post data on self-ageism and attitudes towards other age groups, which would enable us to test whether interventions can reduce ageism across generations. A potential study could identify older people with negative attitudes towards younger persons prior to participation and target them for intervention. Last, due to a lack of ideal standardized measures, we plan to examine the technology measures used in this program with the goal of validating the measures for continued use.

Conclusion

As technology becomes more integrated into everyday life, ensuring digital inclusion for older adults is increasingly important since technology adoption and use among older adults occurs at a slower rate compared to the overall population (Pew Research Center, 2019). This study demonstrated the value of a quasi-experimental design to provide strong evidence that program participation improves technology use and digital competence. Continued research on

intergenerational technology programs can help to meet the demand and need for both digital inclusion among older adults and for reduced ageism in society across all generations.

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Conflicts of Interest:

We have no conflicts of interest to report.

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