

Knowledge, Attitudes and Behaviors of Older Adults and College Students Participating in Recycling Mentors, a Service-Learning, Environmental Health Education Program

Michelle Lee D'Abundo, PhD, MSH, CHES

Associate Professor of Public Health Studies
School of Health & Applied Human Sciences
University of North Carolina Wilmington
601 South College Road
Wilmington, NC 28403-5956
Telephone: 910-962-7451
Email: dabundom@uncw.edu

Elizabeth Fugate-Whitlock, PhD

Lecturer, Gerontology Program
School of Health & Applied Human Sciences
University of North Carolina Wilmington
601 S. College Road
Wilmington, NC 28403-5625
Telephone: 910-962-7816
Email: whitlocke@uncw.edu

Kelly Ann Fiala, PhD, ATC

Associate Professor of Athletic Training
Chair, Department of Health and Sport Sciences
Salisbury University
1101 Camden Avenue,
Salisbury, MD 21801-6860
Telephone: 410-543-6347
Email: kafiala@salisbury.edu

Eleanor Krassen Covan, PhD

Professor Emeriti Gerontology
School of Health & Applied Human Sciences
University of North Carolina Wilmington
601 S. College Road
Wilmington, NC 28403-5625
Telephone: 910-962-3435
Email: covane@uncw.edu

ABSTRACT

Purpose: The purpose of this research was to assess the knowledge, attitudes and practices of both students and older adults that participated in a service-learning, environmental health education program called Recycling Mentors (RM). **Methods:** Surveys were conducted before and after participation in RM. Quantitative data were analyzed using SPSS. Specifically, means and standard deviations were

calculated for all items excluding demographics. Paired sample *t*-tests were conducted for student data while two-way ANOVAs were conducted for the older adult data. **Results:** Pre/post surveys indicated older adult interaction effects were observed for several behaviors: recycling glass and cans outside the home and recycling cans inside the home. Students showed significant increases in the frequency of recycling behaviors for all recyclable items both inside and outside of the home, but no significant knowledge or attitude changes were revealed. Regardless of whether participants were in the intervention or control group, older adults' recycling knowledge increased. This increase likely indicates general raised awareness about recycling for older adults that could have occurred from completing assessments, interactions with students or self-directed learning. **Conclusions:** Environmentally themed programs like RM seem to be mutually beneficial to students, older adults and the community. Students gained practical experience facilitating a community education program. Both older adults and students changed behaviors that will have a positive impact on the community and environment. **Recommendations:** Service-learning programs like RM provide excellent opportunities for colleges and universities to serve the community. While RM was successful, additional research is needed to identify ways to promote recycling among people of all ages.

Key Words: Recycling, Service-Learning, Intergenerational Programs, Environment

INTRODUCTION

Environmental issues affect the health and quality of life of people of all ages. To this end, *Recycling Mentors (RM)*, a service-learning project combining intergenerational, service-learning with environmental health education was developed. Students enrolled in Community Health (HEA 301), Current Issues in Gerontology (GRN 440), and Graduate Current Issues in Gerontology (GRN 540) were trained to implement and evaluate this environmental health education program.

In 2010, Americans generated about 250 million tons of municipal solid waste (MSW), which is also referred to as trash (Environmental Protection Agency, 2011). Residential waste was estimated to be 55 to 65% of total MSW and 35 to 45% came from institutions such as businesses, schools, and hospitals. The recycling rate for 2010 was 34.1% with 85 million tons of MSW being recycled or composted. About 12% of MSW is combusted for energy recovery and 54.2% (136 million tons) was discarded in landfills.

Even with recycling and composting only at 34.1% in United States, the benefits are significant. According to the Environmental Protection Agency (2011) by recycling 85 million tons of MSW, the annual benefit is more than 186 million metric tons of carbon dioxide equivalent emissions reduction. This reduction is comparable to removing the emissions from over 36 million passenger vehicles. Overall,

recycling can result in cleaner land, air, and water, overall better health, and a more sustainable economy (Environmental Protection Agency, 2011). Consequently, it would seem beneficial to everyone to increase recycling of all MSW.

For both older and younger adults, individual perceptions such as perceived difficulty, self-efficacy and convenience regarding recycling influence individual behaviors. Lindsay and Strathman (1997) advised perceiving recycling as difficult inhibited recycling behaviors. Nixon and Saphores (2009) suggested the convenience of recycling is perhaps a better predictor than knowledge about the benefits of recycling when attempting to change behaviors. More specifically, Corso (2007) reporting on a *Harris Poll* suggested recycling might increase if it was cheaper and easier to access.

Regardless of age, all Americans could be doing a better job of recycling. In 2007, 30% of adults from ages 19 to 30 reported recycling nothing, while only 19% of adults aged 62 and older reported recycling nothing. Seventy-seven percent of American adults recycle some things at home, yet 23% recycle nothing (Corso, 2007). While some people assume younger generations are more likely to recycle, research findings about college students have been inconclusive. In a college student sample conducted more than twenty years ago, Williams (1991) found that most were recycling bottles, cans and newspapers. A few years later, Barker, Fong, Grossman, Quin, and Reid (1994) found

college students were likely to report positive attitudes about recycling and recycling behaviors, but when observed only 14% actually did recycle. More recently, Kelly, Mason, Leiss, and Ganesh (2006) explained a lack of knowledge about specific recycling requirements such as what can be recycled and how, was the largest barrier to college students recycling. Iyer and Kashyap (2007) assessed the effectiveness of a recycling program for college students in resident halls. They found interventions, incentives and information were vital to encourage recycling. Schmidt (2007) found students enrolled in an environmental issues course reported higher levels of environmental awareness and environmentally-conscious behaviors than students who had not taken the class. In an online survey of Oxford University students about recycling, Robertson and Walkington (2009) reported extrinsic motivators influenced recycling behavior. They found one of the most important things that needed to be done regarding recycling was to remove barriers by improving the quality and accessibility of local recycling facilities.

Environmentalism and Age

Many gerontological researchers have noted a focus on the environment has been missing from the study of aging (Wright & Lund, 2000; Wright, Caserta, & Lund, 2003). Write and Lund (2000) advised that economics and health care are the two most common themes when discussing the well-being for future generations, but add environmental stewardship should also be considered. Moody (2009) suggested in addition to health and economics, environmental issues put all generations at risk and therefore must be a considered an aging issue.

Findings about relationships between age, concern with the environment, and activism are inconsistent. Some researchers have found older adults were less likely to be concerned about the environment while other researchers have documented positive relationships between age and environmentalism. Explanations for why age differences occur also vary. In an early study of these relationships, Buttell (1979) found older adults were less concerned with the environment and related activism than younger adults. Mohai and Twight (1987) also disclosed a negative correlation between age and environmental concerns. Guagnano and Markee (1995) reported the level of environmental concern expressed by an older adult was

impacted by where they resided and varied by the environmental issue. Wright, Caserta, and Lund (2003) surveyed older adults to examine their involvement in protecting the environment. In their sample, older adults did not want to become involved with environmental activities. Furthermore, religious affiliation and residency status had the strongest relationships with their measures of environmental attitudes and concerns. In terms of willingness to be active participants in environmental issues, they were more likely to be active if they had higher levels of social concerns and higher levels of knowledge of environmental consequences. In contrast to these studies, Dietz, Stern, and Guagnano (1998) found a positive relationship between age and environmentalism, noting the oldest participants in their research were most likely to report consumer behaviors that were deemed environmentally friendly. Nixon and Saphores (2009) reported households that included at least one person over the age of 65 were 1.6 times more likely to recycle. Other researchers concluded older people were more likely to recycle than younger ones, in part because they had more time to do so (Derksen & Gartrell, 1993; Scott, 1999; Jenkins, Martinez, Palmer, & Podolsky, 2003; Li, 2003; Barr, 2007).

Pillemer, Wagenet, Goldman, Bushway, and Meador (2009) disclosed differences among age groups when asked about volunteerism in environmental organizations. They found most adults surveyed age 65 and beyond (especially people age 75 and older) did not volunteer for environmental organizations. In a study conducted by the AARP (2008), a difference in optimism regarding one's impact on the environment based on age was found. Fewer adults over the age of fifty felt they could play a role in protecting the environment as compared to adults under age fifty. Although age groups differed in optimism, the AARP study found no significant difference in recycling behavior.

Environmental issues including recycling affect individuals of all ages and therefore no age group or region is exempt from conservation efforts. Statistics have shown low levels of recycling participation in the southern region of the United States (Corso, 2007) where this project took place. Research like the current study is important to gain a better understanding about recycling, knowledge, attitudes and behaviors associated with interventions like *RM*.

PURPOSE

The purpose of this research was to assess the knowledge, attitudes and practices of both students and older adults that participated in a service-learning, environmental health education program called Recycling Mentors (RM). Specifically, the researchers assessed the knowledge, attitudes and behaviors of older adults and students who participated in RM both at the beginning and end of the study.

METHODS

The Role of the Community

The year before RM was implemented a local senior center was interested in getting recycling containers for their facilities. One of the instructors that conducted RM applied for a grant to fund the purchase of the recycling containers for the senior center, which was rejected. The director of the senior center was still interested in providing environmentally themed education programs to the older adults in New Hanover County. As a result, the idea of RM was conceived. After contacting many government and community agencies to gather information about recycling with little success, it was evident that there was a need for educational programming focused on recycling.

Sampling, Participants, and Setting

Participation in RM for both students and older adults occurred over a three-month period. Convenience sampling was used for RM. Inclusion criteria for students consisted of enrollment in one of three courses in the Fall 2009 academic semester: Current Issues in Gerontology (GRN 440), Graduate Current Issues in Gerontology (GRN 540), or Community Health (HEA 301). Many of the undergraduate students enrolled in GRN 440 or HEA 301 were Community Health Education majors or students minoring in Gerontology. However, the classes are open to all majors on campus. The students enrolled in GRN 540 were students pursuing a Master's degree in Gerontology. Inclusion criteria for older adult participants included being 60 years of age or older and living in New Hanover County, North Carolina. Each student was asked to locate two older adult participants.

Institutional Review Board and Informed Consent

In preparation for RM, students received training about the protection of human subjects,

implementing the program and working with older adults. In order to participate in RM and as a requirement for each course, students completed an online Collaborative Institute Training Initiative tutorial concerning the protection of human subjects. All were required to provide a completion certificate to the course instructor. Next, students were trained to implement the program through an educational session about recycling, interviewing skills and working with older adults. The instructor of each course provided training for the students participating in RM. In addition, instructors coordinated the implementation of the program including student participation and data collection.

Institutional Review Board approval was obtained before this research was conducted at a mid-sized, coastal, southeastern university. All student Collaborative Institute Training Initiative certificates were provided as part of the Institution Review Board process and approval. Informed written consent was obtained from all student and older adult participants. Signed consent forms were submitted to instructors before the beginning of the program.

Procedure

Students selected two older adult participants that met the criteria for participation in the study. One older adult was assigned to the control group and one to the intervention group. A pre-Recycling Assessment (RA) was collected from both students and older adults. The control group completed the pre and post assessments. The intervention group completed the pre and post assessments and also received recycling education and set goals.

The age-range for older adults was recorded by students asking control and intervention group participants to identify their age range from the following categories: 60-79, 70-79, 80-89, 90-99, or 100 plus. The gerontology instructor working on this project recommended the use of ranges to increase older adults comfort with sharing their age. The majority of the control group ranged in age from 60-69 years ($n = 21$, 58.3%), were white ($n = 31$, 86.1%), and female ($n = 20$, 55.6%). They had an income greater than \$40,000 ($n = 16$, 44.4%), resided within the city limits ($n = 19$, 52.8%) and lived in a single family home ($n = 31$, 86.1%). The majority of the intervention group ranged in age from 60-69 years ($n = 16$, 44.4%), were

white ($n = 32$, 88.9%), and female ($n = 26$, 72.2%). They had an income greater than \$40,000 ($n = 13$, 36.1%), resided within the city limits ($n = 23$, 63.9%) and lived in a single family home ($n = 29$, 80.6%). Please see Table 1 for demographic information both control and intervention groups.

Students initiated three contacts with the intervention group participants. First, the education component of *RM* was delivered to participants within one month of consent. The *RM* educational component was guided by a color brochure designed to guide students in their conversations with older adults about recycling and to remind older adult participants about recycling. The brochure consisted of information about recycling in the following areas: 1) recycling relating to health, the local economy, and personal costs, 2) new legislation in North Carolina banning rigid plastics from landfills, 3) ways to reduce product usage in the home, 4) information about what could be recycled and where to recycle in local municipalities, 5) types of plastics and paper that can be recycled and explained the importance of doing so, and 6) a website and telephone number for participants to get more related information (D'Abundo, Fugate-Whitlock, & Fiala, 2011). The brochure was developed by the first two authors in conjunction with a county employee working with recycling. Graduate students also conducted semi-structured interviews with participants that helped them better understand older adults' opinions about the environment.

Next, students encouraged participants to write three recycling goals. One month later, a third contact was made consisting of a check-in to identify potential issues and to provide encouragement. At the three month interval, students conducted the post-RA with all participants and completed it themselves.

Instruments

The RA included questions about demographic information, recycling knowledge, attitudes and behaviors. The RA was developed and reviewed for face and content validity by a panel of experts including the first two authors and a local county recycling representative. The RA was conducted before and after the program for students and older adults. While variables were slightly different, demographic information was collected from both students and older

adults. The student demographics included the following: year in school, race, gender, living arrangement, and residence. Older adult demographics included the following: age, race, gender, income and residence. All shared their attitudes about recycling and the environment (i.e. recycling helps the environment) by responding to four questions using a 4-point Likert scale ranging from Strongly Disagree (-2) to Strongly Agree (2) and an undecided option. The same Likert scale was utilized for five items related to knowledge about recycling (i.e. Recycling reduces the need for new waste sites). Recycling behaviors at home and outside their residence were also assessed for cans, glass, paper and plastic through the use of a 5-point Likert scale (never (1), rarely (2), sometimes (3), most of the time (4), and always (5)). In order to evaluate the reliability of participant responses on the RA, internal consistency was assessed using Cronbach's Alpha reliability coefficients.

Data Analysis

Means and standard deviations were calculated for each of the items with the exception of the demographic data. Internal reliability of the attitude and knowledge scales for both students and older adults ranged from adequate to strong. For students, the reliability coefficients were as follows: attitude (pre $\alpha = 0.963$, post $\alpha = 0.931$) and knowledge (pre $\alpha = 0.953$, post $\alpha = 0.792$). For older adults, reliability coefficients for the intervention group were as follows: attitude (pre $\alpha = 0.709$, post $\alpha = 0.749$) and knowledge (pre $\alpha = 0.869$, post $\alpha = 0.850$). Reliability coefficients for the control group were as follows: attitude (pre $\alpha = 0.901$, post $\alpha = 0.893$) and knowledge (pre $\alpha = 0.938$, post $\alpha = 0.912$).

For analysis of the student data, paired sample t-tests were used to compare pre/ post-RA differences for students. For the analysis of the older adult data, two-way ANOVAs with two within-subjects factors, time (pre and post) and group (control and intervention), were conducted to determine if there were differences in recycling knowledge, attitudes and behaviors. Results were considered significant at the $p < 0.05$ level. Demographic data were analyzed using frequency distributions. All data analysis was conducted using PASW (Predictive Analytics Software) 18.0.

RESULTS

Thirty-six students completed the pre/post-RA for both their control and intervention participants resulting in a total of 72 older adult participants.

Older Adults

For older adults, there were no significant differences between groups or across time for the attitude scale, $p > 0.05$. Knowledge scores showed a significant difference between pre and post intervention, $F(1,24) = 4.548$, $p = 0.043$. Knowledge increased from the pre-test (1.093) to the post-test (1.315). Recycling behaviors were also analyzed for group differences across time. No significant differences between groups or across time were observed for recycling paper outside the home, recycling paper inside the home and recycling glass inside the home, $p > 0.05$ were indicated.

Group by time interaction effects (the differences between the control and intervention group from the beginning to the end of the Recycling Mentors) were observed for the following behavior variables: recycling glass outside the home, recycling cans outside the home and recycling cans inside the home. For the control group, glass recycling behavior outside the home decreased from pre (2.8 ± 1.3) to post (2.7 ± 1.3) while the intervention group's increased from pre (2.2 ± 1.3) to post (3.0 ± 1.5), $F(1,27) = 9.615$, $p = 0.004$. Please see Figure 1 for the summary of change in recycling behavior for glass outside the home. For the control group, can recycling behavior outside the home slightly increased from pre (2.7 ± 1.4) to post (2.8 ± 1.3) while the intervention group's substantially increased from pre (2.4 ± 1.4) to post (3.2 ± 1.4), $F(1,27) = 4.373$, $p = 0.046$. Please see Figure 2 a summary of the change in recycling behavior for cans outside the home. For the control group, can recycling behavior inside the home slightly decreased from pre (3.7 ± 1.4) to post (3.5 ± 1.4) while the intervention group's increased from pre (3.4 ± 1.6) to post (4.0 ± 1.2), $F(1,26) = 4.993$, $p = 0.034$. Please see Figure 3 for a summary of change in recycling behavior for cans inside the home.

In addition, time differences (from beginning to the end of the Recycling Mentors program) were observed for recycling plastic inside and outside the home. Regardless of group

assignment, recycling behavior increased from pre to post. For recycling plastic outside, the behavior increased from 2.7 ± 1.4 (pre) to 3.1 ± 1.4 (post), $F(1,27) = 4.457$, $p = 0.044$. For recycling plastic inside, the behavior increased from 3.6 ± 1.4 (pre) to 4.0 ± 1.1 (post), $F(1,26) = 4.864$, $p = 0.036$. Please see Table 2 for the summary of the ANOVA results for recycling knowledge, attitudes and behaviors older adults in this project.

Students

While thirty-six students collected pre/post assessments from older adults, the total number of students that served as mentors was forty-three. Some students did not collect the post survey, because of older adult participant program attrition. The majority of students were enrolled in their senior year of college ($n = 20$, 46.5%), Caucasian ($n = 35$, 81.4%), females ($n = 38$, 88.4%), who currently lived off-campus ($n = 33$, 76.7%) within city limits ($n = 31$, 72.1%) and permanently resided in state ($n = 39$, 90.7%). Students showed significant increases in the frequency of recycling behaviors for all recyclable items both in and outside of the home following the RM program, $p < 0.05$ (see Table 3). Attitude scores for the pre-RA (1.4 ± 0.6) and post-RA (1.4 ± 0.8) were not significantly different, $t(38) = 0.107$, $p = 0.915$. Likewise, knowledge score for the pre assessment (1.4 ± 0.8) and post assessment (1.6 ± 0.7) were not significantly different, $t(37) = -1.042$, $p = 0.304$.

CONCLUSIONS

In consideration of our research findings, regarding knowledge for older adults, there was a significant time effect. When the control and intervention groups were combined, knowledge increased. This increase likely indicates general raised awareness about recycling for older adults could have occurred from completing assessments, interactions with students or self-directed learning.

Older Adult Recycling Behaviors

Regarding recycling behaviors, the older adults in both the control and intervention groups increased in the following areas: plastic outside of the home and plastic inside the home. It is important to note during the implementation of RM a ban on rigid plastics in state landfills took effect. This information was included in the education component, which was only delivered to intervention group members. However, older

adults in both groups may have heard about the ban via media sources like television, radio or newspapers. Participation in *RM* may have contributed to increased awareness that led to behavior changes regarding recycling plastics for older adults.

The older adults who received the education component had greater improvements in recycling behaviors than the participants who did not receive the education component, which was indicated by the group by time interaction effect for glass and cans outside the home and cans inside the home. Thus, the education component of the program was specifically effective in motivating recycling behavior change for glass outside the home and cans inside and outside the home. This finding supports previous research where recycling participation increased when information provided addressed knowledge gaps such as how, what, and where to recycle (Kelly et al., 2006) and addressed barriers to recycling (Robertson & Walkington, 2009).

It is interesting to note there was no change regarding recycling paper inside or outside the home. Information about recycling paper was included in *RM*, but was not shown to motivate behavior change. Learning how to effectively communicate information about the importance of recycling paper is an area that needs to be addressed in the future implementation of *RM*.

Student Recycling Behaviors

The students showed significant changes in recycling behaviors, but no significant knowledge or attitude changes were indicated. The pre-RA scores for both knowledge (1.4 ± 0.6) and attitudes (1.4 ± 0.8) were high for students (between agree and strongly agree). For students, with the exception of plastic, the pre-RA scores for recycling behavior in the home ranged from rarely to sometimes. Interestingly, all recycling behaviors outside the home and recycling plastic inside the home ranged from sometimes to most of the time. It seems students had pre-existing knowledge about recycling, however, their behaviors prior to the program did not reflect their knowledge and attitudes about environmental conservation.

The contradiction of knowledge, attitudes and behaviors for students demonstrated in this study has been explored in previous research where similar issues regarding recycling were

evaluated in college student populations. In research focused on college students by Iyer and Kashyap (2007), recycling attitudes and behaviors are only weakly correlated to environmental attitudes and behaviors. Lee (2008) found students who had pro-environmental attitudes tended to recycle more. However, the relation of recycling and conservation behavior was relatively small and the majority of students participating in the study did not recycle regularly even though their city provided biweekly curbside service. In Kelly et al. (2006), a majority of student respondents (98.7%) thought recycling was beneficial for the environment, however, only about half reported to be frequent recyclers, either on campus or at home. As discussed previously, it seems removing recycling barriers such as improving access and convenience is essential for college students (Robertson & Walkington, 2009). Schmidt (2007) reported enrollment in an environmental issues course was associated with higher levels of environmental awareness and environmentally-conscious behaviors. Therefore, programs like *RM* that emphasize the what, where and when of recycling while promoting environmental awareness are essential to promoting and increasing recycling in college populations.

The results from this study demonstrate the importance of extrinsic motivators, such as ease of recycling, when it comes to recycling behavior. Therefore, if a local authority would like to encourage the residential population to recycle more, one of the most important things that they need to do is remove barriers. This could include improving the quality and accessibility of local recycling facilities and providing curbside pick-up.

Limitations

One limitation of the study was that all information collected was self-reported by *RM* participants. Observations were not conducted to confirm if older adults and students were actually recycling what they reported. There was no compensation for participation in the project or achieving desired results. Therefore, it is deemed that participants accurately reported their recycling behaviors. Another issue was that the pre/post surveys were conducted before and after the three month program. No follow-up surveys were collected from students or older adults. Therefore, the longitudinal effects of participating in *RM* are not known.

RECOMMENDATIONS

Regarding recycling, there is much room for improved awareness and increased recycling in all populations. This research focused on college students mentoring older adults. However, older adults could also mentor college students and other members of the community about recycling. Pillager et al (2009) found older adults offer a great untapped potential of environmental based volunteerism. They further posit that participation in environmental volunteerism will have positive health and social impacts on the older adult. Implications for future research could include replicating the present study by training older adults to serve as mentors to teach college students about the benefits of recycling. Another possibility would be to have both older adults and college students serve as peer educators by sharing information with one another.

While researchers in several national studies have concluded older adults are more likely to recycle than are younger ones (Derksen & Gartrell, 1993; Scott, 1999; Jenkins et al. 2003; Li, 2003; Barr 2007). Others have concluded older adults are less likely to be involved in environmental activities (Buttall, 1979; Mohai & Taight, 1987; AARP, 2008; Pillemer et al., 2009). In this research, older adult knowledge increased at the end of the program to the level of the pre-RA scores for students. Based on this finding, the older adults had less pre-existing knowledge about recycling than students. Consequently, recycling may be a good topic for service-learning projects for students or for community education extension programs offered through colleges and universities designed specifically for older adult learners. In addition, college and universities may also consider community partnerships with local senior centers where students and older adults could work together on solutions to community issues like recycling.

Environmentally themed programs like RM seem to be mutually beneficial to students, older adults and the community. Students gained practical experience facilitating a community education program. Both older adults and students changed behaviors that will have a positive impact on the community and environment. Consequently, service-learning programs like RM provide excellent

opportunities for colleges and universities to serve the community.

While RM was an excellent service-learning opportunity, there are limitations to programs like RM that focus on individual knowledge, attitudes and behaviors without attention to external factors like community services and policies. For example, many participants in RM lived in areas where there was no curb-side pick-up, which is a barrier to recycling for students and older adults. As mentioned earlier in the text, RM was conducted when a ban of rigid plastics in state landfills took effect. However, there were no penalties associated with the ban of rigid plastics and therefore the ban is a suggestion with no consequences. In order for a program like RM to be effective in promoting community-level change, issues relating to advocacy and policy would need to be added. The lesson for college and university-based service learning may be that all recycling programs should include some type of community-level component including advocacy and policy.

In conclusion, efforts to increase individual and community-level recycling must be multifaceted. Additional research is needed to understand ways to reduce perceived difficulty and eliminate barriers that will result in improved self-efficacy regarding recycling. With information and training, regardless of age, education or background, anyone that is concerned about the environment can serve as a "recycling mentor."

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Table 1. Demographic Information for Control and Intervention Group Participants

	Control	Intervention
Gender		
Female	20 (55.6%)	26 (72.2%)
Male	16 (44.4%)	10 (27.8%)
Age		
60-69	21 (58.3%)	16 (44.4%)
70-79	12 (33.3%)	13 (36.1%)
80-89	3 (8.3%)	6 (16.7%)
90-99	0 (0.0%)	1 (2.8%)
100 and up	0 (0.0%)	0 (0.0%)
Race		
White	31 (86.1%)	32 (88.9%)
Black	4 (11.1%)	4 (11.1%)
Hispanic	1 (2.8%)	0 (0.0%)
Residence		
Within city limits (Wilmington)	19 (52.8%)	23 (63.9%)
Outside city limits (Wilmington)	10 (27.8%)	5 (13.9%)
New Hanover County	4 (11.1%)	7 (15.2%)
Brunswick County	1 (2.8%)	0 (0.0%)
Other	2 (5.6%)	1 (2.8%)
Residence Type		
Single family home	31 (86.1%)	29 (80.6%)
Multiple family home	0 (0.0%)	2 (5.6%)
Apartment	3 (8.3%)	3 (8.3%)
Other	2 (5.6%)	2 (5.6%)
Income		
10,000 or less	4 (11.1%)	1 (3.1%)
10,001-20,000	3 (8.3%)	5 (15.6%)
20,001-30,000	8 (22.2%)	6 (18.8%)
30,001-40,000	2 (5.6%)	7 (21.9%)
Over 40,000	16 (44.4%)	13 (36.1%)
No Response	3 (8.3%)	4 (11.1%)

Table 2. ANOVA Results for Recycling Knowledge, Attitudes and Behaviors in Older Adults

Item	Control		Intervention		Interaction Effect			Time Effect			Group Effect		
	Pre	Post	Pre	Post	F	Df	p	F	Df	p	F	Df	p
Knowledge	1.0 ± 0.9	1.3 ± 0.5	1.2 ± 0.6	1.4 ± 0.5	0.595	1,24	0.448	4.548	1,24	0.043	0.712	1,24	0.407
Attitudes	1.1 ± 0.9	1.3 ± 0.5	1.3 ± 0.5	1.4 ± 0.5	0.808	1,24	0.378	1.678	1,24	0.208	1.049	1,24	0.316
Plastic (Out)	2.9 ± 1.4	3.0 ± 1.2	2.5 ± 1.4	3.2 ± 1.5	3.212	1,27	0.084	4.457	1,27	0.044	0.074	1,27	0.788
Paper (Out)	2.8 ± 1.3	2.7 ± 1.2	2.3 ± 1.3	2.6 ± 1.3	2.397	1,27	0.133	0.867	1,27	0.360	1.713	1,27	0.202
Glass (Out)	2.8 ± 1.3	2.7 ± 1.3	2.2 ± 1.3	3.0 ± 1.5	9.615	1,27	0.004	3.215	1,27	0.084	0.470	1,27	0.499
Cans (Out)	2.7 ± 1.4	2.8 ± 1.3	2.4 ± 1.4	3.2 ± 1.4	4.373	1,27	0.046	9.606	1,27	0.004	0.017	1,27	0.897
Plastic (In)	3.7 ± 1.3	3.8 ± 1.2	3.4 ± 1.5	4.2 ± 1.1	3.805	1,26	0.062	4.864	1,26	0.036	0.017	1,26	0.897
Paper (In)	3.3 ± 1.5	3.3 ± 1.4	3.2 ± 1.5	3.7 ± 1.5	1.992	1,26	0.071	2.525	1,26	0.124	0.327	1,26	0.572
Glass (In)	3.5 ± 1.4	3.5 ± 1.4	3.0 ± 1.7	3.6 ± 1.6	3.127	1,26	0.089	2.828	1,26	0.105	0.310	1,26	0.582
Cans (In)	3.7 ± 1.4	3.5 ± 1.4	3.4 ± 1.6	4.0 ± 1.2	4.993	1,26	0.034	1.752	1,26	0.197	0.202	1,26	0.657

Table 3. Recycling Behaviors in Students

Item	Mean ± Standard Deviation			t	Df	p
	Pre	Post	Change			
Plastic (Out)	3.5 ± 1.1	4.0 ± 0.9	-0.5 ± 1.3	-2.479	39	.018
Paper (Out)	3.0 ± 1.2	3.5 ± 1.2	-0.5 ± 1.5	-2.084	38	.044
Glass (Out)	3.0 ± 1.4	3.5 ± 1.3	-0.5 ± 1.2	-2.339	38	.025
Cans (Out)	3.2 ± 1.3	3.7 ± 1.2	-0.5 ± 1.5	-2.189	38	.035
Plastic (In)	3.4 ± 1.6	4.3 ± 1.1	-0.9 ± 1.3	-4.120	38	.000
Paper (In)	2.5 ± 1.3	3.2 ± 1.2	-0.7 ± 1.5	-2.903	38	.006
Glass (In)	2.8 ± 1.7	3.6 ± 1.4	-0.8 ± 1.3	-3.620	38	.001
Cans (In)	3.0 ± 1.6	3.7 ± 1.4	-0.6 ± 1.4	-2.850	38	.007

Figure 1. Change in recycling behavior for glass outside the home.

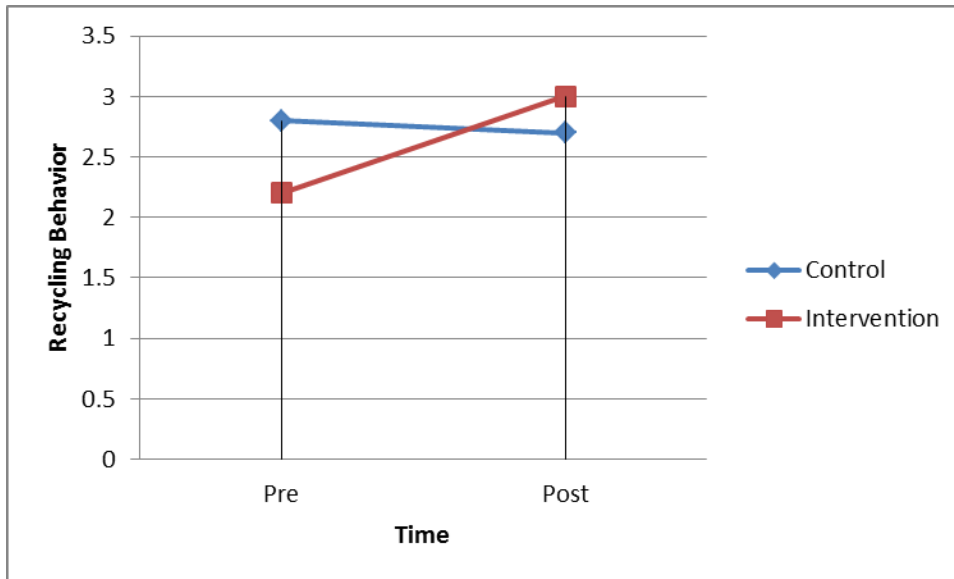


Figure 2. Change in recycling behavior for cans outside the home.

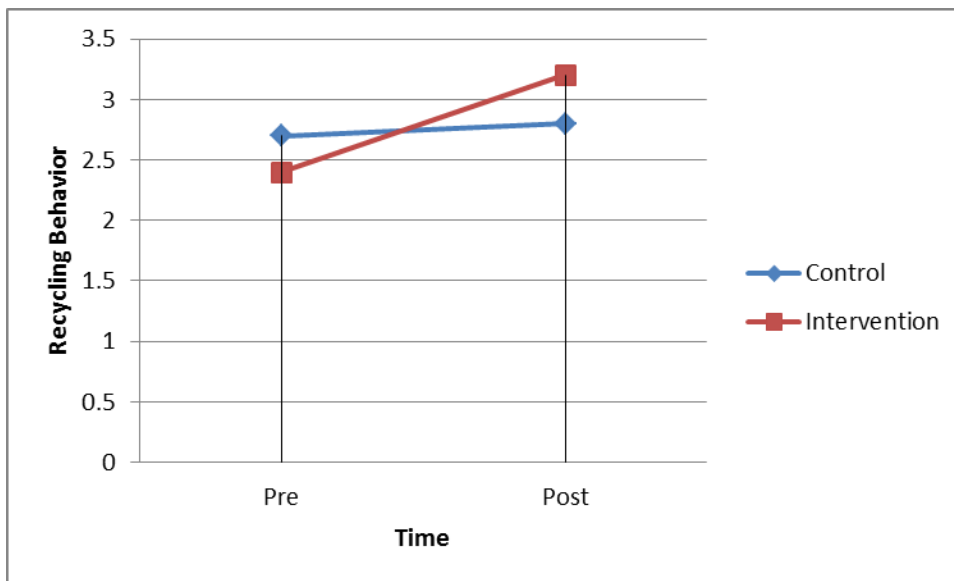


Figure 3. Change in recycling behavior for cans inside the home.

