College Students' Ageist Behavior: The Role of Aging Knowledge and Perceived Vulnerability to Disease

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This cross-sectional study examined the associations among perceived vulnerability to disease, aging knowledge, and ageism (positive and negative) in a sample of undergraduate students enrolled in a human development course (N = 649; M age = 19.94 years, SD = 2.84 years). Perceived vulnerability to disease and aging knowledge were associated with self-reported ageist behaviors. Undergraduates who viewed themselves as more susceptible to disease and knew less about the aging process tended to report more negative ageist behavior. Sex moderated the association between aging knowledge and ageist behavior, indicating the association was stronger for males. Discussion focuses on implications for gerontology educators.

KEYWORDS   ageism, pedagogy, undergraduates, vulnerability to disease

Ageism, or discrimination based on chronological age, influences individuals' attitudes and behaviors toward older adults (Cherry & Palmore, 2008). The prevalence of ageism has been noted in young children, older populations, those who work with older adults (Gonzales, Morrow-Howell, & Gilbert, 2010), and in undergraduate students enrolled in aging courses (Cottle & Glover, 2007). Additionally, a majority of older adults report they have suffered from some form of ageism (Palmore, 2004). The widespread prevalence of ageism and ageist behavior has multiple implications for our rapidly aging

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population, as ageism may influence older adults' implicit attitudes about their competencies and self-stereotypes, which may influence their everyday functioning (Levy, 2001). Ageism may also influence legislation and policy decisions affecting older adults, which directly influences society's attitudes toward this population and likely affects older adults' perceptions of themselves. As such, it is increasingly important to understand the determinants of ageism so that researchers can find ways to counteract such biases.

BACKGROUND: PREDICTORS OF AGEISM

Several studies have confirmed the presence of positive (kind, wise, and happy) and negative (slow, sick, and unhappy) attitudes toward older adults. However, in undergraduate samples, empirical studies documenting the frequency of positive and negative attitudes toward older adults have reported mixed results. Several studies have consistently found that younger adults exhibit negative attitudes toward older adults (Gellis, Sherman, & Lawrence, 2003; Stuart-Hamilton & Mahoney, 2003), whereas others found that college students report more positive attitudes toward older adults (Gonzales et al., 2010; Narayan, 2008). Other researchers concluded that undergraduates hold neutral attitudes toward older adults (Funderburk, Damron-Rodriguez, Storms, & Solomon, 2006; Koren et al., 2008). Despite the findings on attitudes, relatively little research has examined how undergraduates actually behave toward older adults in everyday life. Because ageism can have a harmful impact on older adults, focusing on behavior (rather than attitudes) may help inform interventions aimed at reducing differential treatment toward older adults in various domains (e.g., health, legal, service settings). Therefore, this study aimed to assess college students' self-reported ageist behaviors (positive and negative), instead of attitudes.

Research findings point to consistent demographic and psychological predictors of ageism including age, sex, and aging knowledge. Males (Allan & Johnson, 2009; Kalavar, 2001) and younger undergraduates (Kalavar, 2001) have been found to exhibit more ageism. Among social work students, Gellis et al. (2003) found that male sex and younger age independently predicted less favorable attitudes toward older adults. Another aspect of ageism concerns people's lack of knowledge about aging (Cherry & Palmore, 2008), and educators have made numerous attempts to influence students' attitudes via instructional methods to increase aging knowledge. Greater knowledge of aging processes might be expected to lessen ageism, but previous findings have been mixed. For example, many studies show that undergraduates who take an aging or human development course have fewer ageist attitudes toward older adults and more accurate knowledge of aging (Allan & Johnson, 2009; Dorfman, Murty, Ingram, & Li, 2007; Harris & Dollinger, 2001; Knapp & Stubblefield, 2000; O'Hanlon &

Brookover, 2002). Additionally, the benefits of developmental courses (both positive attitudes and accurate knowledge) have been found to endure over time (Funderburk et al., 2006). In contrast, Narayan (2008) and Cottle and Glover (2007) did not find significant relations between aging knowledge and ageist attitudes. However, previous research has primarily examined predictors of ageist attitudes, not self-reported ageist behavior.

We are aware of two studies that examined self-reported ageist behaviors. Among a sample of undergraduate and older adults, Cherry and Palmore (2008) found that most people readily admit to positive ageist behaviors, and that women endorsed positive ageism more often than men. Similarly, Allen, Cherry, and Palmore (2009) found that students across various educational backgrounds in social services (e.g., undergraduate, graduate) were more likely to endorse and admit to positive ageist behaviors than negative ageist behaviors.

PERCEIVED VULNERABILITY TO INFECTIOUS DISEASE

To develop interventions and policies that decrease ageism or age-related discrimination, one must understand its causes and antecedents. In addition to the aforementioned predictors, researchers have examined the multiple, subtle ways in which cognitive processes may influence behavior toward older adults. Duncan and Schaller (2009) suggest that the psychological mechanisms of ageism are only somewhat understood. Recent work (Duncan & Schaller; Park, Faulkner, & Schaller, 2003) suggests that ageist behavior is likely to operate in individuals who are overly concerned with disease transmission.

Research shows that beliefs about personal susceptibility to disease transmission contribute to discriminatory antisocial behavior (e.g., avoidance behavior; see Faulkner, Schaller, Park & Duncan, 2004; Park et al., 2003; Park, Schaller, & Crandall, 2007). Perceived vulnerability to disease produces aversive responses to those who pose risk of illness transmission; people are likely to react with prejudicial responses when they feel especially vulnerable (Schaller & Park 2011). When the presence of infectious disease is perceived psychological responses such as disgust and aversive cognitions inhibit interpersonal contact (Schaller, Miller, Gervais, Yager, & Chen, 2010). Individual differences in perceived vulnerability to disease predict aversion toward adults who are immigrants (Faulkner et al., 2004), obese (Park et al., 2007), physically disabled, and old (Park et al., 2003). These appearance-based prejudices are exaggerated among people who merely perceive to be vulnerable to infectious disease (Schaller & Park, 2011). For example, Park et al. (2003) found that individual differences in perceived vulnerability to disease were associated with behavioral avoidance of people with disabilities. Based upon their theoretical model of disease

avoidance, participants avoided interactions with disabled people because physical disability was immediately linked with disease. Furthermore, visual perception of other people's apparent symptoms of disease triggers the perceiver's immune cells to respond more aggressively by producing greater quantities of white blood cells (Schaller et al., 2010).

Just as perceived vulnerability to infectious disease is associated with the avoidance of the physically disabled, research suggests vulnerability to disease may also be associated with ageism and ageist behavior (Duncan & Schaller, 2009), especially if older adults are perceived as sickly, cognitively impaired, and disabled (Osgood, 1996). We are aware of one study (Duncan & Schaller, 2009) that provides evidence demonstrating that ageist behavior may be a result of individuals' level of perceived vulnerability. Implicit avoidance of the elderly was greater under circumstances in which the threat of disease transmission was salient and occurred primary among adults who perceived themselves to be especially vulnerable to infectious disease (Duncan & Schaller, 2009). However, whether vulnerability to disease is associated with ageist behavior in undergraduate samples has not been explored by research.

OVERVIEW OF THIS STUDY

The purpose of this study is to examine how perceived vulnerability to infectious disease and aging knowledge may relate to positive and negative ageist behavior in a sample of undergraduate students enrolled in a human development course. This study built upon existing research by including variables that have been shown to be associated with ageist behavior: age, sex, and preexisting aging knowledge. This study uniquely included information on students' actual exam performance on general knowledge about life-span development. We hypothesized that younger age, male sex, stronger perceived vulnerability to disease, and less aging and course knowledge would be significantly associated with negative ageist behavior. We expected the same pattern with positive ageism, with the exception of male sex. Based on the consistent sex differences in ageist attitudes, we conducted an exploratory analysis to examine whether sex moderated the effect of the independent variables on ageist behavior.

METHOD

Participants and Procedure

Participants were 649 undergraduate students enrolled in a large, multisection human development course at a large mid-Atlantic university during Spring 2011 semester. A majority of the sample was female ($n = 436$), with

fewer undergraduate students being male ($n = 213$). This gender difference is mainly due to the large number of psychology, nursing, and education majors (many of whom are female), who were required to enroll in human development. Most participants were either freshman (40%) or sophomores (37%), missed class 0 to 3 times across the semester (58%), and approximately age 20 ($SD = 2.84$, range = 18–60 years). Data on race/ethnicity were not collected. Students had, on average, two living grandparents ($SD = 1.32$). Most participants resided in Maryland, New Jersey, Pennsylvania, or West Virginia. Demographic characteristics of the sample appear in Table 1. Although data were collected from multiple sections that were taught by various instructors, there were no significant differences in student characteristics across sections.

Based on the approved Institutional Review Board (IRB) protocol, students completed four online surveys throughout the semester for course credit. The survey content was related to life-span developmental psychology and addressed aspects of physical, cognitive, and social development during infancy, childhood, adolescence, and older adulthood. Students completed the required, online surveys as part of an out-of-classroom assignment and earned 20 points (3.6% of final grade) for each survey they completed. These

TABLE 1 Participant Characteristics ($N = 649$)

	%	M	SD	Range
Age		19.95	2.84	18–60
25 years old or younger	96.8			
25 years or older	3.1			
Gender				
Men	32.8			
Women	67.2			
Class rank				
Freshman	39.0			
Sophomore	36.4			
Junior	15.6			
Senior	6.8			
No. of absences				
Never	13.3			
0–3 times	58.1			
4–6 times	22.7			
7–9 times	4.7			
10+ times	1.2			
Volunteered with older adults				
No	28.2			
Yes	71.8			
No. of living grandparents		2.35	1.32	0–6
Closeness with grandparents				
Very close	33.9			
Moderately close	27.3			
Somewhat close	24.0			
Not very close	14.8			

online surveys were collected to stimulate classroom discussions on life-span psychology.Data were deidentified, and we supplied a protocol to our IRB in which we asked to use the data as deidentified, archived data. The IRB approved our protocol and considered our study "exempt." By continuing with their participation, students acknowledged that they read the purpose of each online homework survey and agreed to participate.

Toward the end of the semester, but prior to any lectures on late life, participants completed the last out-of-classroom assignment that addressed their contact with their older adult grandparents, perceived vulnerability to disease, ageist behaviors, and knowledge about the aging process. After students completed the online homework assignment, their teaching instructors presented them with descriptive statistics of the survey results. Of the 702 students who were enrolled in the course, 649 completed the online homework assignment (92.4% participation rate).

Measures

This study included four questionnaires that were presented in a fixed order: a demographic questionnaire, a measure of vulnerability to disease, an assessment of the aging process, and a measure of ageist behavior. The overall survey took students approximately 15 to 30 minutes to complete. Basic demographics included information regarding students' age, gender, class rank, number of living grandparents, closeness with grandparents, and experience volunteering in an older adult setting. We also collected data on students' exam performance on the age periods taught earlier in the semester (infancy/childhood, adolescence/adulthood) and the number of times students missed class.

Perceived vulnerability to disease was assessed using the 15-item Perceived Vulnerability to Disease (PVD) Questionnaire (Duncan, Schaller, & Park, 2009) that measures adults' perceived susceptibility to infectious disease. The PVD consists of two subscales: Perceived Infectability (7 items; Cronbach's alpha = .89), which assesses beliefs toward susceptibility to disease, and Germ Aversion (8 items; Cronbach's alpha = .72), which assesses discomfort in situations that pose an increased likelihood of pathogen transmission. Item responses range from 1 (*strongly disagree*) to 7 (*strongly agree*) on a Likert-type scale. Higher scores indicate a heightened perceived vulnerability to the transmission of infectious disease. Perceived infectability items include "If an illness is going around, I will get it," and "I am more likely than the people around me to catch an infectious disease," whereas germ aversion items include "I prefer to wash my hands pretty soon after shaking someone's hand" and "It really bothers me when people sneeze without covering their mouths."

To assess knowledge of aging, students completed Palmore's (1988) 25-item Facts on Aging Quiz (FAQ), a widely used instrument designed to assess individuals' age-related beliefs and misconceptions about the aging process.

The FAQ includes true-false items and measures individuals' knowledge of biological, social, and cognitive facts about old age. Each true-false item was scored as being either correct (1) or incorrect (0); higher scores reflect greater knowledge of the aging process. Internal consistency was acceptable (Kuder-Richardson [KR-20] = .65).

Ageist behavior was assessed using the 20-item Relating to Old People Evaluation (ROPE; Cherry & Palmore, 2008). The ROPE is a self-report measure of the frequency and type of ageist behaviors in which people engage, as they relate to older adults. The questionnaire contains six positive types of ageism and 14 negative types. Item responses ranged from 0 (*never*) to 2 (*often*) and are summed within each dimension, and then divided by the highest possible score for that dimension (12 for the 6-item scale, and 28 for the 14-item scale). Higher scores indicate a greater frequency of ageist behavior. Items include "I hold doors open for old people because of their age" (positive) and "I talk louder or slower to old people because of their age" (negative). Cronbach's alpha was acceptable (positive α = .66; negative α = .75).

Analysis

Preliminary analyses included descriptive statistics and bivariate correlations among all variables used in this study. Multiple analysis of variance tests assessed mean differences among all the variables as a function of sex. Significant variables from the bivariate correlations analyses ($p < .05$) were included in multiple regression models to predict negative and positive ageism. Specifically, we ran a hierarchical linear regression to examine whether aging knowledge and the perceived vulnerability to disease variables predicted ageism above and beyond demographic characteristics. Sex was coded as 0 for males and 1 for females. We included cases listwise and examined the variance inflation factor (VIF) to assess multicollinearity.

Due to consistent sex differences in ageism, our exploratory analyses examined the moderating effect of sex in the regression model. In this model, significant predictor variables from the first regression were tested in the first step, with their interactions with sex added in the second step of the regression. Significant variables were centered prior to computing their product term with sex. We used Aiken and West's (1991) methods to further understand any significant interaction effects.

RESULTS

Descriptive Analyses

Table 2 presents the means, standard deviations, and Pearson correlations among all variables. Students' reported perceived vulnerability to disease was relatively low including a mean perceived infectability score of 24.43

TABLE 2 Means, Standard Deviations, and Bivariate Correlations Among Constructs

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
						Correlations				
Age (years)	19.95	2.84	—							
Sex (male = 0, female = 1)	—	—	−.09*	—						
Prior exam performance	57.16	8.98	−.01	.17**	—					
Perceived infectability	24.43	3.83	−.02	−.03	−.09	—				
Germ aversion	33.36	4.81	−.07	.01	−.12**	.27**	—			
Aging knowledge	16.48	3.28	.02	.08*	.29**	−.09	.00	—		
Positive ageism	0.64	0.28	−.02	.18**	−.03	.08	.05	−.05	—	
Negative ageism	0.25	0.13	−.11**	−.17**	−.17**	.18**	.12**	−.30**	.15**	—

Notes. Exam score was out of 75 possible points.
*$p < .05$, **$p < .01$.

($SD = 3.83$; range $= 12.00$–49.00), indicating neutral attitudes toward personal susceptibility to disease. A mean germ aversion score of 33.36 ($SD = 4.81$; range 18.00–56.00), indicated slight overall discomfort in situations that connote germ transmission. Participants had, on average, a FAQ score of 16.48 ($SD = 3.37$, range 6–25), which indicated students answered more than one half (66%) of the FAQ correctly. Students self-reported few ageist behaviors during everyday life. The total positive ageism score was .64 ($SD = .18$, range 0–1), indicating students sometimes engaged in positive ageist behavior. The mean negative ageism score was .25 ($SD = .13$, range 0–1), indicating students rarely engaged in negative ageist behavior.

Table 3 presents the results of a multivariate analysis of variance (MANOVA) for all measures as a function of sex. A significant effect of sex on positive ageism emerged with females reporting more positive ageism than males. There was also a significant sex effect on negative ageism with males reporting more negative ageism than females. Our analyses also showed a significant sex effect on aging knowledge with females scoring higher on the FAQ than males. No significant sex differences emerged for either of the PVD subscales.

Multiple Regression Analysis

Table 2 presents the bivariate analyses among all variables. Negative ageism was negatively correlated with age, sex, prior exam performance, and aging knowledge, whereas positively correlated with perceived infectability and germ aversion. We did not run the planned regression for positive ageism due to lack of significant bivariate associations. Table 4 lists the results of the hierarchical regression that examined whether students' knowledge of aging and perceived vulnerability to disease predicted negative ageism above and beyond demographic characteristics. Step 1 included age, sex, and prior

TABLE 3 Means, Standard Deviations, and Multivariate Analyses of Variance F Ratios for All Measures as a Function of Sex

	ANOVA														
	Positive ageism			Negative ageism			Aging knowledge			Perceived infectability			Germ aversion		
	M	SD	F	M	SD	F	M	SD	F	M	SD	F	M	SD	F
Sex			20.16**			17.62**			4.36*			0.05			0.01
Men	0.59	0.18		0.28	0.15		16.05	3.55		24.50	3.56		33.39	5.11	
Women	0.66	0.17		0.24	0.12		16.64	3.18		24.42	3.97		33.35	4.65	

Note. MANOVA = $F(1, 16) = 9.42, p < .01$. F ratios are Wilks's approximation of Fs.
*$p < .05$, **$p < .01$.

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TABLE 4 Hierarchical Regression Analysis Predicting Negative Ageist Behavior ($n = 554$)

Predictor variable	b	SE(b)	β	p	R^2	ΔR^2
Step 1						
Age	−0.005	0.002	−0.121	.00		
Sex	−0.039	0.012	−0.133	.00		
Exam performance	−0.002	0.001	−0.150	.00		
					0.06	
Step 1, $F(3, 550) = 11.41$, $p < .01$						
Step 2						
Age	−0.005	0.002	−0.101	.01		
Sex	−0.034	0.012	−0.116	.00		
Exam performance	−0.001	0.001	−0.077	.07		
Aging knowledge	−0.010	0.002	−0.244	.00		
Perceived infectability	0.005	0.001	0.129	.00		
Germ aversion	0.002	0.001	0.069	.10		
					0.14	0.09
Step 2, $F(6, 547) = 15.30$, $p < .01$						

exam performance. Step 2 included the FAQ, perceived infectability, and germ aversion.

Age, sex, and prior exam performance accounted for a significant amount of the variance in negative ageism, indicating that younger students, males, and students who performed poorly on previous human development exams were likely to self-report more negative ageist behavior. In the second model, the FAQ, perceived infectability, and germ aversion accounted for a significant proportion of variance in negative ageism (14%) after controlling for the effects of age, sex, and prior exam performance. Although controlling for demographic characteristics, negative ageism was significant related to the FAQ and perceived infectability. Undergraduates were more likely to report negative ageist behaviors if they knew less about the aging process and perceived themselves to be more vulnerable to infectious disease. In our exploratory analyses (see Table 5), we first tested each significant predictor (age, FAQ, perceived infectability) with their interaction with sex in a preliminary analysis, and then included the significant interaction terms to the final regression model. The interaction term between Sex and the FAQ explained a significant increase in negative ageism. The unstandardized simple slopes indicated that the association between FAQ and negative ageism was significant for both sexes but was stronger for males ($-.43$ $t = -5.65$, $p < .01$) than females ($-.26$, $t = -5.15$, $p < .01$) (see Figure 1).

DISCUSSION

Our results provide the first evidence indicating that undergraduates' negative ageism is associated with perceived infectability to disease. The evidence

TABLE 5 Exploratory Regression Analysis Predicting Negative Ageist Behavior With Interaction Terms ($n = 626$)

Predictor variable	b	SE(b)	β	p	R^2	ΔR^2
Step 1						
Age	−0.005	0.002	−0.105	.01		
Sex	−0.043	0.011	−0.149	.00		
Aging knowledge	−0.011	0.002	−0.270	.00		
Perceived infectability	0.005	0.001	0.144	.00		
					0.14	
Step 1, $F(4, 621) = 25.38$, $p < .01$						
Step 2						
Age	−0.005	0.002	−0.106	.01		
Sex	−0.042	0.011	−0.146	.00		
Aging knowledge	−0.015	0.002	−0.376	.00		
Perceived infectability	0.005	0.001	0.149	.00		
Aging knowledge × Sex	0.007	0.003	0.134	.03		
					0.15	0.01
Step 2, $F(5, 620) = 21.40$, $p < .01$						

from this study is consistent with previous research findings that perceived vulnerability to disease is associated with the avoidance of the elderly (Duncan & Schaller, 2009). This is consistent with the present findings as perceived infectability to disease was associated with negative, rather than positive, ageism. The negative ROPE items imply behavioral avoidance of older adults (e.g., "avoid old people because they are cranky"), whereas the positive ROPE items infer social interactions with older adults (e.g., "enjoy conversations with old people because of their age"). Interestingly, although negative ageism was correlated with the other form of perceived vulnerability, germ aversion was not a significant predictor in the regression model. Although this findings is consistent with previous research (Duncan et al., 2009), future research is warranted. Perceived infectability is specific to infectious disease, whereas the germ aversion scale was developed to measure emotional discomfort in situations that increase the likelihood of
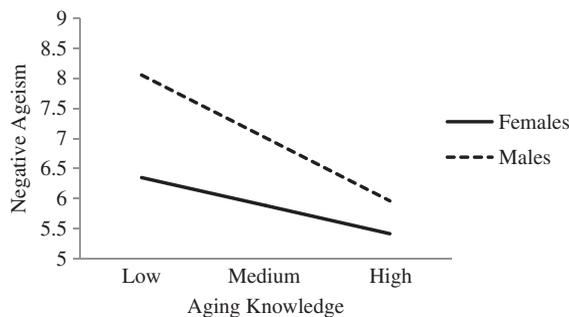
FIGURE 1 Moderation by sex. Lines represent simple slopes of aging knowledge predicting negative ageist behavior.

disease transmission. Given the conceptual distinction, it is not surprising that in this model, germ aversion was not significantly associated with negative ageism. This subscale is related to the emotional response that is linked to infectious disease avoidance. In our sample of undergraduates, a strong emotional reaction was not predictive of ageist behavior.

Furthermore, sex was not significantly associated with either PVD subscale. In the Duncan et al. (2009) validation study, females scored higher in perceived infectability and germ aversion than males. In our sample, PVD scores across sex were very similar. Like Duncan et al. (2009), we are not sure how to interpret findings regarding potential sex differences in PVD. However, the PVD validation study sample was ethnically diverse; whereas we did not collect information on the diversity of our sample.

The association between perceived infectability and negative ageism has implications for identifying contextual variables that may contribute to the degree to which older adults experience discrimination. For example, individuals' perceived vulnerability is influenced by any situation that makes disease salient. Thus, the extent to which the media and public health officials exaggerate the threat of infectious disease may have unintended, but serious, consequences on ageism (Duncan & Schaller, 2009). Ineffectively worded public health warnings may affect the degree to which individuals feel vulnerable to disease. Duncan and Schaller (2009) also suggested that ageism might be reduced by policies that promote hygiene and interventions that increase the quality of health care. By doing so, individuals are less likely to fear infectious disease because they are exposed to situations that emphasize health and well-being. From an educator's perspective, perhaps this translates into volunteer activities where undergraduate students interact with elderly in community settings that are associated with wellness and hygiene (e.g., lifelong learning institutes, local volunteer organizations, and senior community centers that promote healthy living) that may consequently emphasize that older adults are not disease risks.

This study also provides evidence about the importance of improving aging knowledge as a means of reducing negative ageism. Our results indicate that the FAQ was negatively associated with ageism, and that sex moderated this effect. Students, especially males, who knew less about the aging process self-reported more negative ageist behavior. In addition, students' prior exam performance on the early stages of the life span was negative associated with negative ageism. However, this association was not significant in the second multiple regression model, which included the FAQ and perceived vulnerability scales.

Our results also demonstrate, as do others, that younger students tend to report more negative ageism (Kalavar, 2001) and that, compared to females, males report more negative ageism (Allan & Johnson, 2009). Female students were more likely to report positive ageism (Cherry & Palmore, 2008). Even with these significant findings, more research is needed to determine what

specific aging knowledge (e.g., cognitive, biological, or social aging knowledge) best predicts ageism. In addition, research is needed to understand what types of undergraduate psychology courses would be most effective in reducing positive and negative ageism. Perhaps, courses that integrate social/volunteer opportunities in tandem with lectures and in-class critical thinking opportunities would be beneficial in reducing negative attitudes toward older adults.

Despite the significant findings, a number of limitations must be addressed. As in any cross-sectional study, causation cannot be established. It is unclear whether perceived vulnerability predicts ageist behavior or vice versa. In regards to sampling, students may have been self-selected, such that those with more accurate views of aging and more positive views of older adults were likely to enroll in a course on human development. Because the measures were completed as an online homework assignment, results may have been biased such that students who cared more about their course performance were likely to participate. We do not have data on the students who declined to participate. Another limitation relates to the use of self-report measures. First, there is an overreliance on episodic recall and participants are more likely to overreport socially desirable behaviors. Thus, participants may not have been accurately reporting the frequency in which they engage in ageist behavior. Second, Palmore's FAQ has been criticized for measuring stereotypes of older adults, rather than knowledge (Klemmack, 1978). Although a majority of research suggests the FAQ is reliable, we used the revised questionnaire, which compensates for the original measure's weaknesses in vague terminology (Miller & Dodder, 1980).

Taken together, our results lend further support to the usefulness of perceived vulnerability to disease to understanding ageist behavior among adults. Although this study supports the link between perceived vulnerability and negative ageist behavior, our results explained a modest amount of variance in ageism and we therefore encourage replication of our model. Future studies would benefit from sampling a wider pool of subjects and in courses other than human development.

REFERENCES

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Allan, L. J., & Johnson, J. A. (2009). Undergraduate attitudes toward the elderly: The role of knowledge, contact and aging anxiety. *Educational Gerontology*, *35*, 1–14.

Allen, P. D., Cherry, K. E., & Palmore, E. (2009). Self-reported ageism in social work practitioners and students. *Journal of Gerontological Social Work*, *52*, 124–134.

Cherry, K. E., & Palmore E. (2008). Relating to Older People Evaluation (ROPE): A measure of self-reported ageism. *Educational Gerontology*, *34*, 849–861.

Cottle, N. R., & Glover, R. J. (2007). Combating ageism: Change in student knowledge and attitudes regarding aging. *Educational Gerontology*, *33*, 501–512.

Dorfman, L., Murty, S., Ingram, J., & Li, H. (2007). Evaluating the outcome of gerontological curriculum enrichment: A multi-method approach. *Gerontology & Geriatrics Education*, *27*, 1–21.

Duncan, L. A., & Schaller, M. (2009). Prejudicial attitudes toward older adults may be exaggerated when people feel vulnerable to infectious disease: Evidence and implications. *Analyses of Social Issues and Public Policy*, *9*, 97–115.

Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual Differences*, *47*, 541–546.

Faulkner, J., Schaller, M., Park J. H., & Duncan, L.A. (2004). Evolved disease–avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes and Intergroup Relations*, *7*, 333–353.

Funderburk, B., Damron-Rodriguez, J., Storms, L. L., & Solomon, D. H. (2006). Endurance of undergraduate attitudes toward older adults. *Educational Gerontology*, *32*, 447–462.

Gellis, Z. D., Sherman, S., & Lawrence, F. (2003). First year graduate students' knowledge of and attitude toward older adults. *Educational Gerontology*, *29*, 1–16.

Gonzales, E., Morrow-Howell, N., & Gilbert, P. (2010). Changing medical student's attitudes toward older adults. *Gerontology & Geriatrics Education*, *31*, 220–234.

Harris, L. A., & Dollinger, S. (2001). Participation in a course on aging: Knowledge, attitudes, and anxiety about aging in oneself and others. *Educational Gerontology*, *27*, 657–667.

Kalavar, J. M. (2001). Examining ageism: Do male and female college students differ? *Educational Gerontology*, *27*, 507–513.

Klemmack, D. L. (1978). Comment: An examination of Palmore's Facts on Aging Quiz. *The Gerontologist*, *18*, 403–405.

Knapp, J. L., & Stubblefield, P. (2000). Changing student' perceptions about aging: The impact of an intergenerational service learning course. *Educational Gerontology*, *26*, 611–621.

Koren, M. E., Hertz, J., Munroe, D., Rossetti, H., Robertson, J., Plonczynski, D, . . . Ehrlich-Jones, L. (2008). Assessing students learning needs and attitudes: Considerations for gerontology curriculum. *Gerontology & Geriatrics Education*, *28*, 39–56.

Levy, B. R. (2001). Eradication of ageism requires addressing the enemy within. *The Gerontologist*, *41*, 578–579.

Miller, R. B., & Dodder, R. A. (1980). A revision of Palmore's Facts on Aging Quiz. *The Gerontologist*, *20*, 673–679.

Narayan, C. (2008). Is there a double standard of aging?: Older men and women and ageism. *Educational Gerontology*, 34, 782–787.

O'Hanlon, A. M., & Brookover, B. C. (2002). Assessing changes in attitudes about aging: Personal reflections and a standardized measure. *Educational Gerontology*, *28*, 711–725.

Osgood, N. J. (1996). Society does not respect the elderly. In C. P. Cozie (Ed.), *An aging population: Opposing viewpoints* (pp. 173–187). San Diego: CA: Greenhaven Press.

Palmore, E. B. (1988). *The Facts on Aging Quiz* (2nd ed.). New York, NY: Springer.

Palmore, E. B. (2004). Ageism in Canada and the United States. *Journal of Cross-Cultural Gerontology*, *19*, 41–46.

Park, J. H., Faulkner, J., & Schaller, M. (2003). Evolved disease-avoidance processes and contemporary anti-social behavior: Prejudicial attitudes and avoidance of people with physical disabilities. *Journal of Nonverbal Behavior*, *27*, 65–87.

Park, J. H., Schaller, M., & Crandall, C. S. (2007). Pathogen-avoidance mechanisms and the stigmatization of obese people. *Evolution and Human Behavior*, *28*, 410–414.

Schaller, M., Miller, G. E., Gervais, W. M., Yager, S., & Chen, E. (2010). Mere visual perception of other people's disease symptoms facilitates a more aggressive immune response. *Psychological Science*, *21*, 649–652.

Schaller, M., & Park, J. H. (2011). The behavioral immune system (and why it matters). *Current Directions in Psychological Science, 20*, 99–103.

Stuart-Hamilton, I., & Mahoney, B. (2003). The effect of aging awareness training on knowledge of, and attitudes towards, older adults. *Educational Gerontology, 29*, 251–260.