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Research Article

Dog Walking, the Human–Animal Bond and Older Adults' Physical Health

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Abstract

Purpose of the Study: This study explored the associations between dog ownership and pet bonding with walking behavior and health outcomes in older adults.
Design and Methods: We used data from the 12th wave (2012) of the Health and Retirement Study which included an experimental human–animal interaction module. Ordinary least squares regression and binary logistic regression models controlling for demographic variables were used to answer the research questions.
Results: Dog walking was associated with lower body mass index, fewer activities of daily living limitations, fewer doctor visits, and more frequent moderate and vigorous exercise. People with higher degrees of pet bonding were more likely to walk their dog and to spend more time walking their dog each time, but they reported walking a shorter distance with their dog than those with weaker pet bonds. Dog ownership was not associated with better physical health or health behaviors.
Implications: This study provides evidence for the association between dog walking and physical health using a large, nationally representative sample. The relationship with one's dog may be a positive influence on physical activity for older adults.

Keywords: Exercise/physical activity, Recreational therapy/activities, Preventative medicine/care/services, Function/mobility, Dog walking, Pets

Walking is positively associated with health outcomes in older adults. Dog walking may differ from other reasons for walking (i.e., recreation, transportation) because it involves the relationship with a companion animal. Although some studies linking dog ownership with walking have benefited from robust and nationally representative samples (e.g., Cutt, Giles-Corti, Knuiman, Timperio, & Bull, 2008; Ham & Epping, 2006), the majority of studies exploring the motivation of dog walking have had small samples sizes (e.g., Degeling & Rock, 2012). This study uses a nationally representative sample to investigate the link between the health benefits associated with dog ownership and dog walking, and older adults' relationships with their dogs as a motivator for walking.

Importance of Walking for Older Adults

The Centers for Disease Control and Prevention (2014) recommends that adults of all ages engage in 150 or more minutes of moderate physical activity per week. Walking is the most common form of leisure-time physical activity for adults older than 60 years, because it is a self-paced and

low impact form of exercise which does not require specialized equipment, facilities, or training, and it can be done with others or alone (Lee & Buchner, 2008). Younger age and better physical health status were significant predictors of more hours of walking per week (Hughes, McDowell, & Brody, 2008). Walking predicted overall mobility for frail older adults, with higher levels of walking being associated with better functional mobility (Alexander et al., 2000), as well as lower risk for coronary heart disease (Manson et al., 1999; Tanasescu et al., 2002). Older women who walked regularly not only had better functional performance (e.g., lower extremity function and balance) at baseline than non-walkers, but were also less likely to experience declines in these domains over a 1-year period (Simonsick, Guralnik, Volpato, Balfour, & Fried, 2005). Adults aged 55 and older who walked a mile at least once a week were less likely to be in poor or fair health, have difficulties with activities of daily living (ADLs), transition to a nursing home, and have a lower likelihood of mortality (Wolinsky, Stump, & Clark, 1995). Walking has been promoted as a vital component of interventions that seek to decrease fall risk (Cadore, Rodríguez-Mañas, Sinclair, & Izquierdo, 2013) and to improve lower limb strength, aerobic endurance, and mobility (Magistro, Liubicich, Candela, & Ciairano, 2014).

Dog Ownership and Walking Behavior

A meta-analysis found that dog owners engaged in significantly more physical activity than dog non-owners (Christian et al., 2013). Individuals older than 50 years who frequently walked their dog were more likely to report having a sense of community, more likely to get at least 150 minutes of physical activity per week, and less likely to be sedentary than those who did not live with a dog (Cutt et al., 2008; Garcia et al., 2015; Ham & Epping, 2006; Hoerster et al., 2011; Richards, McDonough, Edwards, Lyle & Troped, 2013; Toohey, McCormack, Doyle-Baker, Adams, & Rock, 2013). Dog owners were more likely to continue to participate in recreational walking throughout the year as opposed to other recreational walkers who were less likely to walk in winter months (Lail, McCormack, & Rock, 2011). In 2013, the American Heart Association issued a statement declaring that dog ownership was likely to be associated with a decreased risk of cardiovascular disease, which was most likely attributable to the activity of dog walking (Levine et al., 2013). However, dog ownership is not synonymous with dog walking, because many people who live with dogs do not walk them regularly.

For those who walk their dogs, responsibility to provide exercise for their dog is often the underlying motivation for dog walking. Dog walkers report that walking is essential for the physical and mental needs of their pet; secondary reasons for dog walking included strengthening their relationship with their dog, perception of the dog's enjoyment of walking, and providing a means to socialize with other people (Degeling & Rock, 2012; Hoerster et al., 2011; Richards et al., 2013). Level of attachment with their dogs was positively associated with the amount of time spent dog walking (Oka & Shibata, 2012).

Dog Walking and Older Adults

Although people become less likely to regularly walk their dogs with advancing age, those who do walk their dogs were not only more likely to meet physical activity recommendations, but also to walk significantly faster (Thorpe et al., 2006). Older adults who walked their dogs regularly were significantly more likely to meet the physical activity requirements than dog non-owners 3 years later. Older adult dog owners who regularly walked their dog had greater functional ability than dog owners who did not walk their dog and dog non-owners (Gretebeck et al., 2013). Furthermore, individuals older than 60 years were more likely to accumulate 30 minutes of dog walking in a 1-day period than younger adults (Richards, 2015). Dog walking is not only beneficial for older adults, but it may also be an activity which promotes walking behavior in general.

There is also evidence that walking with a dog that is not one's pet can motivate walking behavior. Adults 40 years and older who walked with a trained and certified therapy dog had strong adherence to the walking intervention (Johnson & Meadows, 2010). In another study, participation in a weekly volunteer dog walking program at a humane society was associated with a decrease in body mass index (BMI) and an increase in motivation for overall physical activity (Johnson, Bibbo, Osterlind, & Mueller, 2014). Dogs may motivate walking behavior within various populations in a number of ways; the present study focused on the relationship between older adults and their pet dogs.

The study was guided by the ecological model proposed by Sallis and colleagues (2006). They posited that the behavioral component of physical activity is influenced by many environmental and policy factors. These include the interpersonal factors (e.g., demographics, social support, family situations), perceived environment (e.g., safety, accessibility), behavior settings (e.g., neighborhood, home, workplace, school), and policy environment (e.g., zoning codes, healthcare policies/incentives, park policies). Our study focused on companion animals as an interpersonal motivator and supporter of physical activity within the behavior settings of home and neighborhood. A recent meta-analysis of the dog walking literature found the relationship (e.g., attachment, interaction) between the individual and the dog to be one of the strongest predictors of dog walking behavior (Westgarth, Christley, & Christian, 2014).

According to Ainsworth (1991), having a unique affectional bond with another being provides a sense of security

and safety, whereas separation from an attachment figure may lead to negative emotions, which in turn creates a desire to maintain proximity. Older adults report that they share a unique and reciprocal relationship with their companion animals (Peretti, 1990; Ryan & Ziebland, 2015). Further, the amount of time that older adults spend with companion animals is positively associated with the level of attachment to those animals (Peacock, Chur-Hansen, & Winefield, 2012). This serves as the rationale for our hypothesis that the interpersonal relationship with the dog would have a significant influence on walking, which may translate to other physical benefits.

We explored the relationships between dog ownership, dog walking, attachment to the pet dog, and physical health and health behaviors by comparing three groups: dog non-owners, dog owners who walked their dogs, and dog owners who did not walk their dogs. The first research question asked whether dog ownership was associated with better physical health and greater physical activity. We hypothesized that older adults who owned dogs would have better physical health (lower BMI status, fewer ADL limitations, fewer chronic conditions, and fewer doctor visits) and more positive health behaviors (more frequent engagement in moderate and vigorous exercise) than people who did not own dogs. The second research question explored the association between the older adult's attachment to their dog and dog walking behaviors. We hypothesized that higher levels of pet bonding would be associated with dog walking, more frequent dog walking, more time spent dog walking, and greater distances walked during dog walking. Finally, we asked to what extent dog walking was associated with physical health and health behaviors and hypothesized that people who walked their dog would have better physical health (lower BMI status, fewer ADL limitations, fewer chronic conditions, and fewer doctor visits) and more positive health behaviors (more frequent engagement in moderate and vigorous exercise) than people who did not engage in dog walking.

Design and Methods

Data

This study analyzed 2012 data from the Health and Retirement Study (HRS 2012 Core and Module 9) sponsored by the National Institute on Aging (grant number NIA U01AG009740) and conducted by the University of Michigan. The HRS included an experimental Human–Animal Interaction (HAI) module as part of the 2012 wave. These files were merged with the RAND HRS data file—a longitudinal data set based on the HRS data, which was developed at RAND with funding from the National Institute on Aging and the Social Security Administration (Version N; Chien et al., 2014). Institutional Review Board approval was not required nor sought as this is publically available, de-identified secondary data.

The target population for the HRS is non-institutionalized men and women living in the contiguous United States, oversampling Blacks, Hispanics, and Florida residents who are aged 50 and older (Institute for Social Research, 2008). To date, 36,986 respondents have participated in the HRS. For the present study, we used the following sample inclusion criteria (applied in sequential order):

- Selected as the primary HRS respondent. To avoid violating the statistical assumption of independent observations, the sample was restricted to one person per household (the primary HRS respondent), which excluded 13,838 respondents.
- Responded in 2012 and not a proxy interview since the HAI module was only asked of respondents interviewed in 2012; this step excluded 11,802 respondents.
- Selected and responded to the HAI module; this step excluded 10,342 respondents.
- Excluded pet owners who did not own dog and non-pet owners who had experienced recent pet loss. This exclusion criterion, which eliminated 170 respondents, was used in order to focus on health benefits of current dog ownership. Individuals who had experienced recent pet loss might experience residual health benefits from former pet ownership, or the pet loss might negatively impact their health and/or health behaviors.
- Selected only individuals who had positive person-level sampling weights, because sampling weights were used in the analyses; this excluded 11 respondents. By multiplying data by respondents' sampling weights, responses are generalizable to the U.S. population of non-institutionalized adults aged 50 and older.
- Excluded individuals who were underweight because being underweight is associated with worse health outcomes (e.g., mortality) for older adults; this eliminated 20 respondents.
- Required complete data on study variables; this step excluded 32 respondents.

The final sample size was 771, of which 271 respondents had one or more dogs and 500 respondents did not have a dog.

Measurement

Physical Health and Health Behaviors (Outcome Measures)

ADL limitations (self-reported) with everyday activities (e.g., dressing, walking across a room) due to a physical, mental, emotional, or memory problem (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963) that was expected to last more than 3 months (1 = *any difficulty with the activity*, 0 = *no difficulty*; item responses were summed into a scale with a range of zero to five and Cronbach's alpha = .64). *Body mass index* was based on self-reported height and weight, and was computed by dividing weight in kilograms

by height in meters squared. *Number of doctor visits* was measured using the open-ended question "How many times have you seen or talked to a medical doctor about your health, including emergency room, clinic visits, or house calls in the last two years?" (range 0–200). For *number of chronic health conditions*, respondents were asked if a doctor had ever told them that they had any of the following conditions: high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, or arthritis (yes/no; responses were summed together with a range of 0–7 conditions). *Frequency of moderate exercise*: Respondents were asked "How often do you take part in sports or activities that are moderately energetic" (e.g., gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises)? For *frequency of vigorous exercise*, respondents were asked "How often do you take part in sports or activities that are vigorous" (e.g., running or jogging, swimming, cycling, aerobics or gym workout, tennis, or digging with a spade or shovel)? Both exercise variables were coded so that 0 = *hardly ever or never*, 1 = *1–3 times a month*, 2 = *once a week*, 3 = *more than once a week*, and 4 = *every day*.

Dog Ownership, Pet Bonding, and Dog Walking Variables (Primary Predictors)

Dog ownership: Respondents were asked whether they currently had any pets (yes/no) and then what type of animals they owned; this study will focus on dog owners compared with non-pet owners.

A subsample of dog owners was asked a series of questions about their relationship with their dog, including dog walking characteristics. *Pet bonding*: Pet bonding was measured by the HRS using six dichotomous items adapted (by the HRS) from the Lexington Attachment to Pets Scale (Johnson, Garrity, & Stallones, 1992). This instrument was designed to assess the degree of bonding with a particular companion animal. Items included "Do you consider your pet a friend?" and "Do you talk to others about your pet?" These items were answered yes or no with a score of 1 being assigned for each yes response. The responses were summed, for a possible range of 0–6 (higher scores = stronger pet bonding; Cronbach's alpha = .41). *Dog walking*: This was measured by the question "Do you walk your dog(s)?" (1 = dog walkers, 0 = dog non-walkers). *Number of times walking a dog*: This was recorded by participants in response to the question, "How many times per day do you walk your dog(s)?" (0–12 times/day; coded .5 if walk dog less than once per day; coded zero if do not walk dog). *Dog walking time:* Respondents were asked "How many minutes or hours do you walk your dog(s) each time?" Responses given in hours were converted to minutes, so that this variable measured dog walking time in minutes.

Dog walkers were also asked three questions about whether walking their dog had increased the frequency with which they walked generally, their walking speed, and their walking distance. For *walking frequency*, HRS asked "Because you have a dog(s), do you think that overall you walk *a lot more* (=4), *somewhat more* (=3), *about the same* (=2), *somewhat less* (=1), or *a lot less* (=0) than you would if you did not have a dog(s)?" For *walking speed*, HRS asked "Compared with when you walk without your (dog/dogs), when you walk with your dog(s) do you usually walk *a lot faster* (=4), *somewhat faster* (=3), *about the same speed* (=2), *somewhat slower* (=1), or *a lot slower* (=0)?" For walking distance, HRS asked "Compared with when you walk without your dog(s), when you walk with your dog(s) do you usually walk *a much longer distance* (=4), *a somewhat longer distance* (=3), *about the same distance* (=2), *a somewhat shorter distance* (=1), or *a much shorter distance* (=0)?"

Sample Demographic Characteristics and Analysis Weights (Control Variables)

Race: Respondents were asked to self-identify their race; responses were grouped by HRS into three categories: White/Caucasian, Black/African American, and Other races. *Ethnicity*: Respondents were asked if they considered themselves Hispanic or Latino (1 = yes, 0 = no). *Gender*: Respondents were classified as male (coded 0) or female (coded 1). *Household income*: Total annual household income was the sum of all sources of income earned by the respondent and his/her spouse/partner (if applicable). In order to address non-normality issues, a nominal value of $100 was added to each response, and then log transformation was performed. *Education*: Respondents reported their years of education (0–17+) completed by the beginning of HRS participation. *Age*: Age in years was computed by subtracting the date of the interview from the date of birth. *Marital/partnership status*: Individuals were asked about their current marital/partnership status (1 = *living with a spouse/partner*, 0 = *not living with a spouse/partner*). *Analysis weights*: Analyses were weighted to account for the complex sampling design using the standard error stratum information to produce correct estimates of sampling errors (HRS, 2008; standard error stratum variable RAESTRAT). Poststratification person-level sampling weights for 2012 (R11WTRESP) were also used, so that respondent characteristics matched the Current Population Survey demographics of living, non-institutionalized U.S. respondents born prior to 1948 (Chien et al., 2014). All results are from weighted models, unless otherwise indicated.

Data Analysis

Univariate (frequencies, means, standard deviations, skew, kurtosis) analyses were examined to determine the distribution of the data prior conducting multivariate analyses. To answer the research questions, linear regressions and binary logistic regressions were performed using SAS 9.4 software (using SAS commands proc surveyreg and proc surveylogistic).

All of the regression models were controlled for age, household income, gender, race, ethnicity, years of education, and marital status. For research Question 1, the sample included all respondents and examined whether the predictor of dog ownership was associated with health and health behaviors. For the first part of research Question 2, a subsample was selected of people who owned one or more dogs. This subsample was used when testing whether pet bonding was associated with dog walking. Then the subsample was further restricted to dog owners who walk their dog to examine whether pet bonding was associated with dog walking characteristics (e.g., frequency, length of time, distance). For research Question 3, the sample included all respondents to test whether dog owners who walked their dogs had better health and health behaviors than dog non-owners and dog owners who did not walk their dog(s). An alpha level of .05 was selected as the criterion for determining statistical significance.

Results

The majority of respondents were female (51.2%), White (82.4%), non-Hispanic (91.9%), and were living with a spouse/partner (54.1%). The unweighted mean for years of education was 13.05 (*SD* = 2.92) years, and the mean age was 67.03 (*SD* = 10.64) years. Table 1 presents weighted descriptive statistics for demographic characteristics, physical health, and health behaviors. Among dog owners, the mean number of dogs owned was 1.60 (*SD* = 1.51; range: 1–16). For the subsample of dog owners who walked their dogs, the mean number of dogs owned was 1.49 (*SD* = 0.77, range: 1–5). They walked their dogs ranging from 1 to 12 times per day, for an average of approximately 30 minutes per walk (*M* = 29.64, *SD* = 33.43). Dog owners who did not walk their dogs were asked to give their main reason for *not* walking their dog(s). These reasons (unweighted) can be summarized as dog characteristics or behavior (e.g., dog doesn't like to walk, dog not well behaved; *n* = 40; 40.1%), poor health of respondent or dog (*n* = 16; 16.3%), lack of dog owner interest or time (*n* = 6; 6.1%), and other unspecified reasons (*n* = 36; 36.7%).

Multivariate results indicated that dog ownership was not associated with better physical health and health behaviors (results available upon request). The dog ownership predictor was statistically significant in only one of

Table 1. Weighted Descriptive Statistics for Demographics, Pet Bond, Health, and Health Behaviors

	Dog non-owners	Dog owners non-dog walking	Dog owners dog walking
	M (*SD*) or %	*M* (*SD*) or %	*M* (*SD*) or %
Age (years)	67.68 (0.58)	64.25 (0.87)	61.68 (0.59)
Household income (annual)	$72,193 ($7,922)	$62,171 ($6,679)	$83,806 ($8,934)
Female gender	53.42%	47.53%	48.54%
White/Caucasian race	79.64%	88.16%	87.69%
Black/African American race	16.24%	5.99%	5.44%
Other race	5.12%	5.85%	6.87%
Hispanic ethnicity	7.26%	11.55%	8.33%
Living with spouse/partner	50.21%	60.06%	59.45%
Years of education	13.51 (0.14)	12.74 (0.31)	13.79 (0.21)
Degree of pet bond	N/A	5.23 (0.12)	5.76 (0.05)
BMI	28.41 (0.33)	29.43 (0.64)	27.84 (0.48)
Number of ADL limitations	0.30 (0.04)	0.45 (0.11)	0.15 (0.04)
Number of doctor visits (past 2 years)	9.93 (1.28)	10.14 (1.39)	7.04 (0.83)
Number of chronic conditions	1.96 (0.09)	2.43 (0.17)	1.76 (0.13)
Frequency of moderate exercise per week	2.10 (0.07)	1.76 (0.16)	2.48 (0.09)
Every day = 4	9.07%	4.77%	6.50%
More than once per week = 3	41.84%	35.28%	56.93%
Once per week = 2	18.04%	17.69%	21.17%
One to three times per month = 1	12.27%	15.63%	9.01%
Never = 0	18.77%	26.63%	6.39%
Frequency of vigorous exercise per week	1.09 (0.08)	0.95 (0.16)	1.69 (0.12)
Every day = 4	1.97%	2.57%	2.59%
More than once per week = 3	24.49%	18.40%	36.90%
Once per week = 2	9.24%	9.98%	18.35%
One to three times per month = 1	9.26%	11.13%	10.92%
Never = 0	55.04%	58.92%	31.25%

Notes. *n* = 500 for dog non-owners, *n* = 98 dog owners non-walkers, *n* = 173 dog owners dog walkers.
ADL = activities of daily living; BMI = body mass index.

the models and was associated with more chronic conditions (B = 0.38, β = .12, p < .01, 95% confidence interval [CI] = 0.12, 0.65]).

Degree of pet bonding was associated with dog walking characteristics when controlling for age, household income, gender, race, ethnicity, years of education, and marital/partnership status (results available upon request). For each one-point increase in degree of pet bonding, the odds of dog walking was increased by 200% (odds ratio = 3.00, p < .01, 95% CI [1.93, 4.66]). Higher pet bonding scores were associated with more minutes per time of dog walking (B = 3.16, β = .08, p < .05, 95% CI [0.26, 6.06]), but not with number of times per day. For questions that asked whether respondents changed their walking patterns when walking with a dog, walking with a dog was not associated with a change in walking frequency or speed, but stronger pet bonding was associated with respondents' reporting that they walked a shorter distance with their dog than they walked without their dog (B = −0.25, β = −.12, p < .01, 95% CI [−0.43, −0.05]).

Further, dog walking was associated with better physical health, as hypothesized (Table 2). Dog walking was associated with lower BMI, fewer ADL limitations, fewer chronic health conditions, and fewer doctor visits. It was also associated with more frequent moderate exercise and vigorous exercise (Table 3).

Given the focus of this study on older adults, findings related to age bear mentioning. In our models, younger age predicted higher BMI, fewer chronic conditions, more frequent moderate and vigorous exercise, and a greater likelihood of dog walking (p < .05; results available upon request). For respondents who walked their dog(s), older age was associated with self-reports of walking more often, faster, and further with their dog(s) than without their dog(s) (p < .05).

There were a number of reasons given by dog owners for not walking their dogs. The most frequently cited reason (40%) was dog characteristics or behavior (e.g., dog too big or strong, dog does not walk well on leash). Sixteen percent of participants indicated that they did not walk their dog due to their own poor health or the poor health of their dog. Only 6% said that they did not walk their dog because of lack of interest or time.

Discussion

Our regression results indicate that dog ownership (by itself) is not associated with better physical health, but that dog walking is associated with better health and health behaviors. This is consistent with previous research (Gretebeck et al., 2013; Thorpe et al., 2006) which found that the physical activity of dog walking had short- and long-term physical health benefits. Dog walking appears to be the mechanism by which dog ownership promotes health.

Sallis and colleagues' (2006) ecological model states that having a potential partner for physical activity in the home

Table 2. Dog Walking and Other Variables as Predictors of Health Status (N = 271)

	Outcome: Number of chronic conditions			Outcome: Number of ADL limitations			Outcome: Number of doctor visits in past 2 years			Outcome: BMI		
	B	β	95% CI	*B*	β	95% CI	*B*	β	95% CI	*B*	β	95% CI
Intercept	−0.23	0.00	−1.49, 1.02	1.92	0.01*	1.30, 2.54	8.57	0.00	−2.33, 19.48	38.08	0.00**	33.39, 42.77
Walk dog (1 = yes)	−0.42	−0.12**	−0.56, −0.27	−0.27	−0.19**	−0.35, −0.19	−2.99	−0.13**	−4.30, −1.68	−1.57	−0.13**	−2.16, −0.99
Black (ref: White)	0.32	0.05*	0.05, 0.59	0.28	0.10	−0.25, 0.81	5.62	0.12	−1.40, 12.65	−0.55	−0.02	−2.83, 1.74
Other race (ref: White)	−0.25	−0.05*	−0.47, −0.03	0.16	0.08*	0.01, 0.31	1.21	0.04	−0.38, 2.79	1.75	0.10**	1.23, 2.27
Hispanic (1 = yes)	0.13	0.02	−0.06, 0.32	0.36	0.16**	0.23, 0.50	−1.70	−0.05*	−3.37, −0.03	−1.08	−0.06**	−1.75, −0.42
Female (1 = yes)	−0.03	−0.01	−0.19, 0.13	−0.03	−0.02	−0.13, 0.08	−1.48	−0.07	−2.99, 0.04	−0.18	−0.02	−0.86, 0.49
Living with spouse/partner (1 = yes)	−0.14	−0.04	−0.36, 0.07	−0.06	−0.05	−0.16, 0.03	1.72	0.08*	0.06, 3.38	1.15	0.10**	0.47, 1.84
Age (years)	0.08	0.41**	0.07, 0.09	−0.00	−0.05*	−0.01, −0.00	0.10	0.08*	0.01, 0.19	−0.05	−0.07**	−0.09, −0.02
Household income (logged)	−0.22	−0.17**	−0.36, −0.09	−0.09	−0.18**	−0.14, −0.05	−0.91	−0.10*	−1.69, −0.13	−0.51	−0.11*	−0.93, −0.08
Education (0–17+ years)	0.00	0.01	−0.04, 0.05	−0.02	−0.07	−0.05, 0.02	0.33	0.08	−0.15, 0.81	−0.06	−0.03	−0.25, 0.13

Notes. Results are weighted.
ADL = activities of daily living; BMI = body mass index; CI = confidence interval.
*p < .05. **p < .01.

Table 3. Dog Walking and Other Variables as Predictors of Health Behaviors ($N = 271$)

	Outcome: Frequency of vigorous exercise			Outcome: Frequency of moderate exercise		
	B	β	95% CI	*B*	β	95% CI
Intercept	−0.46	0.00	−1.73, 0.82	−0.99	0.00*	−1.80, −0.18
Walk dog (1 = yes)	0.59	0.21**	0.46, 0.73	0.55	0.23**	0.45, 0.65
Black (ref: White)	0.02	0.00	−0.23, 0.26	0.28	0.06	−0.05, 0.61
Other race (ref: White)	−0.65	−0.16**	−0.83, −0.46	−0.33	−0.09**	−0.48, −0.17
Hispanic (1 = yes)	0.61	0.13**	0.45, 0.78	0.06	0.02	−0.11, 0.23
Female (1 = yes)	−0.25	−0.09**	−0.41, −0.08	−0.00	−0.00	−0.11, 0.11
Living with spouse/partner (1 = yes)	−0.13	−0.05	−0.28, 0.02	−0.25	−0.11**	−0.36, −0.14
Age (years)	−0.02	−0.09**	−0.02, −0.01	−0.01	−0.05*	−0.01, −0.00
Household income (logged)	0.13	0.11*	0.02, 0.23	0.19	0.20**	0.13, 0.25
Education (0–17+ years)	0.10	0.20**	0.06, 0.14	0.11	0.25**	0.08, 0.13

Notes. Results are weighted.
CI = confidence interval.
*$p < .05$. **$p < .01$.

increases the likelihood of performing a physical activity. This may be particularly relevant for older dog walkers, as older age was associated with self-reports of walking more often, faster, and further with a dog than without. Further, the built environment also plays a role, as Jenkinson (2013) reported that dog parks may facilitate dog owners' engagement in physical activity (walking) with their dogs.

People who had a greater attachment with their dog were more likely to walk their dog and to walk their dogs for more minutes, but for a shorter distance than they walked without their dog. Dog walking behaviors may be influenced if owners are concerned about the health of their dog, or if the dog has health issues. With this phenomenon taken into consideration, it is not surprising that our findings did not support our hypothesis that those with stronger attachment would walk their dog greater distances. Additionally, owning a dog was associated with more chronic health conditions, so it may be that these conditions limited the distances walked. However, dog walking itself was associated with fewer chronic health conditions. Dog owners with fewer chronic health conditions were more likely to walk their dogs and to walk them in more walks per day, more minutes walked per day, but in shorter distances per walk. The nature of dog walking may help to explain this phenomenon.

Westgarth and colleagues (2010) described the nature of dogs' behavior while walking with their owners. The curiosity of dogs, the intensity of their olfactory capabilities, and the fact that dog walking takes place outdoors may come into play here. Dogs frequently stop to sniff smells that they find of interest and to watch animals in their surroundings, and to meet and greet other dogs encountered during the walk. These behaviors can and may significantly decrease the speed of walking. Our findings do not reveal whether the dogs were being walked on or off the leash. However, Westgarth and colleagues (2010) found that when dogs are walked off the leash, they are more likely to engage with other dogs. Other factors that could contribute to slower walks or shorter walks include dog aggressiveness toward other dogs (Řezáč, Viziová, Dobešová, Havlíček, & Pospíšilová, 2011), friendly interactions with other dogs (e.g., meet and greet; Westgarth et al., 2010), playful interactions with the owner during walks (Rooney, Bradshaw, & Robinson, 2000), and dog age (Rooney et al.).

Our findings raise interesting questions about walking characteristics of dog owners (with and without their dogs). For example, are dog walkers more likely to walk both and without their dog, compared with non-dog walking owners? Also, it would be beneficial to use accelerometers to record walking frequency, speed, and distance during dog walks versus non-dog walks, which would complement the study by Richards, Troped, and Lim (2014) that examined dog walking intensity with accelerometers. Another possibility may be that dog walkers' report of reduced frequency, speed, and distance when dog walking could reflect participants' taking the physical condition of their dog into account when walking together. Although we cannot answer these questions with our results, they do provide strong evidence for the interpersonal relationship with a companion dog on dog walking behavior supporting the results of previous studies (e.g., Westgarth et al., 2014).

Siegel (1990) found that pet owning Medicare enrollees had fewer physician contacts over a 1-year period. In contrast, we found that dog walking (not just dog ownership) was significantly associated with fewer doctor visits over a 2-year time span. Likewise, dog walking was associated with more frequent moderate and vigorous exercise, consistent with the findings of Raina, Waltner-Toews, Bonnett, Woodward, and Abernathy (1999). Another team of investigators found that dog walkers older than 60 years accumulated twice the daily minutes of moderate-to-vigorous activity walking their dogs than people younger than 30 years (Richards, 2015). These minutes were more likely to have been accumulated during multiple times of walking per day. Our findings indicate that dog walkers with a stronger bond to their animals engaged in more daily

bouts of walking and more minutes per walking per day than without their dogs. Taken in tandem, the findings support dog walking as a means to reach recommended physical activity levels. We cannot discern the direction of the relationship between physical health and dog walking; however, dog owners who did not walk their dogs did have poorer overall physical health than those who walked their dogs. Clearly, the health of both people and their pets can shape the behavior of dog walking.

Study Limitations and Strengths

As with any secondary data analysis, we were constrained by the HRS variable construction and measurement. For example, the survey asked a question about the number of doctor visits in the past 2 years, but not the reason for the visits (e.g., illness, prevention). Race was another example of measurement limitations, as the publically available HRS data only categorized individuals as White, Black, or Other. Another study limitation was that the self-report measures for dog walking behaviors and attachment may suffer from recall bias and/or social desirability bias. Also, this study included only a subset of the 23 items in the Lexington Attachment to Pets Scale (Johnson et al., 1992) and modified the response categories from Likert scale to dichotomous responses (yes/no); these changes weakened the psychometric properties of the scale in this sample. Further, ideally this study would have included additional questions about motivation for dog walking and dog walk characteristics (e.g., location of walks, routines, more options for frequency of dog walks). Finally, this was a cross-sectional study, so it was not possible to establish causality; we could only draw conclusions about the associations between dog ownership/walking and health status/behaviors. Longitudinal research is needed to establish temporal ordering and claim causality. Additional research is also needed to examine whether dog ownership and dog walking may mitigate negative effects of social isolation and depression, which have been linked to poor health outcomes. Another limitation of our research is the inability to identify to what extent the older adults in the study may have sustained injuries related to dog ownership or dog walking (Stevens, Teh, & Haileyesus, 2010; Willmott, Greenheld, & Goddard, 2012). Stevens and her colleagues found that cats and dogs accounted for 1% of falls for people of all ages who were treated in emergency departments, and a quarter of these falls could be attributed to dog walking, making the risk fairly small. However, it is necessary to weigh the risk with the benefits of dog walking.

In the present study, we found lower BMI, fewer ADL limitations, fewer chronic health conditions, fewer physician visits, and more frequent moderate and vigorous exercise among older adult dog walkers. Another component of the risk benefit ratio is the bond experienced between dog owners and their dog. This phenomenon has been characterized by feelings of unconditional love and acceptance, which is particularly important for older adults who may be experiencing loss of functional ability and/or connectedness with others (Garrity, Stallones, Marx, & Johnson, 1989; Lago, Delaney, Miller, & Grill, 1990; Pikhartova, Bowling, & Victor, 2014). Another component of the human animal bond is the well-recognized phenomenon of social lubrication (McNicholas & Collis, 2000; Rogers, Hart, & Boltz, 1993) in which the presence of a dog with a person who is walking has been associated with others' more positive perceptions of the dog walker and greater likelihood to interact with those people.

Ecological models of health behavior are often criticized for having too little variation in the natural and/or policy environments and for lacking specificity regarding their proposed influence on behavior (Sallis, Owen, & Fisher, 2008). The multistage area probability sampling design of this study ensures not only demographic variability but also variation in the natural and policy settings of participants. Further, this study specifically examined two mechanisms (i.e., pet bonding encouraging dog walking, dog walking promoting health and health behaviors) by which dog ownership was expected to translate into health benefits.

This study makes a robust contribution to the aging literature through its source of data and study design. The HRS collected data about health and human–animal interactions, which made this study possible. Further, the inclusion of comparison groups, dog non-owners and dog owners who do not walk their dog, allowed us to draw separate conclusions about the health benefits of being a dog owner and the benefits of dog walking. By using the HRS data, our study helps to address one of the recommendations from the National Institutes of Health's (1988) Technology Assessment Workshop that future research on human health should include pet ownership patterns due to their potential "protective" influence on human health.

In conclusion, we found that dog walking was positively related to the physical health of older adults. These results can provide a basis and an impetus for medical professionals to recommend dog ownership and dog walking to their middle-aged and older patients. These individual health benefits may translate to reduced health care expenditures for older adults at the societal level, at a time when Medicare costs are of great concern. Retirement communities could also be encouraged to incorporate more pet-friendly policies, including dog walking trails and dog exercise areas so that their residents could access the health benefits provided by interactions with dogs, and dog walking could be easier for dog owners.

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