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Dog Walking Is Associated With a Favorable Risk Profile Independent of a Moderate to High Volume of Physical Activity

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Background: An innovative strategy for helping people achieve recommended levels of daily physical activity is dog walking. We assessed differences in physical activity and risk indicators between dog owners who 1) walk their dog (n = 399) and 2) do not walk their dog (n = 137) and compared them with adults who do not own dogs (n = 380). ***Methods:*** Participants (39 ± 13 years) were recruited online and completed an electronic questionnaire. *Healthy People 2010* risk indicators included physical activity, overweight status, tobacco use, nutrition behaviors, chronic conditions, depressive symptoms, and social support. ***Results:*** Compared with dog walkers, those who did not own or walk their dog reported less physical activity (MET-min·week^{-1}) and a higher body mass index ($P < .01$). Moreover, after adjusting for age and moderate to high physical activity, those who did not own dogs had significantly greater odds of self-reported diabetes [OR = 2.53; 95%CI (1.17–5.48)], hypertension [OR = 1.71; 95%CI (1.03–2.83)], hypercholesterolemia [OR = 1.72; 95%CI (1.06–2.81)], and depression [OR = 1.49; 95%CI (1.09–2.05)] compared with participants who regularly walked their dogs. ***Conclusions:*** Because of the health benefits associated with dog walking, this activity should be encouraged within communities as a method of promoting and sustaining a healthy lifestyle.

Keywords: exercise, chronic conditions, pets

Regular physical activity is a key counter-measure against excessive weight gain and subsequent risk of several chronic conditions such as type 2 diabetes, cardiovascular disease, colon cancer, osteoarthritis, and osteoporosis.[1,2] More than 60% of American adults do not meet recommended levels of physical activity,[3] however, and therefore, innovative approaches to increasing population physical activity are needed. One such approach for promoting a healthier lifestyle is to incorporate dog walking into the daily routine.

Walking is the most prevalent physical activity reported worldwide, and the numerous health benefits of walking to health and function among the population underscore the importance of this activity within the modern day lifestyle.[4] Of even more recent interest, is the importance of short, but frequent bouts of low-intensity walking and standing with regard to their ability to break up sedentary time[5] and interrupt the molecular deregulatory patterns associated with prolonged sitting.[6,7] Walking behaviors are complex, however, and exist within a larger social, cultural, temporal, and environmental context.[8] Given the strong social bonds existing between humans and dogs, it remains unclear why intervention efforts to increase walking at either the individual or community level have not addressed dog walking. Given the popularity of walking and the fact that in 2007 there were approximately 72 million dogs owned as pets in the United States,[9] the public health impact of incorporating dogs into a regular routine of daily walking appears substantial.

While the findings of previous research examining the health effects of dog ownership are positive, these studies are few and have only studied dog ownership in relation to limited health variables, such as physical activity or body weight. The purpose of this investigation was to determine differences in physical activity level and multiple behavioral and health outcomes among dog owners who do and do not walk their dog, and people who do not own dogs. To maximize the public health utility of these data, we considered the leading health indicators from *Healthy People 2010*, along with several other commonly-used risk behaviors and inactivity-related chronic conditions. We hypothesized that people who did not own dogs, or who did not walk their dogs would be less physically active and would have a significantly poorer risk profile compared with dog owners who regularly walked their dogs. To our knowledge, this is the most comprehensive study of this relationship to date.

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Methods

Participants

Participants (living in the United States and 18 years of age or older) were recruited online *via* selected classifieds (eg, Craiglist.org), social networking group forums (eg, Dogster.com), and dog-related blogs. The study advertisement indicated that the purpose of the survey was to assess physical activity and health levels between pet-owners and those without pets. To ensure that dog owners and those without dogs had similar sociodemographic characteristics, dog owners were asked to nominate 2 or 3 people without dogs to participate. The online link to the Survey Monkey questionnaire was made available for the participants in Fall 2009. As an incentive, $1.00 was donated to animal welfare charities [Best Friends Animals Society and the National Animal Interest Alliance (NAIA)] for the first 500 completed surveys received. The study protocol was approved by the Institutional Review Board of The George Washington University Medical Center and all participants gave informed consent.

Instrumentation

Participants were asked to complete an electronic questionnaire comprising the following 4 independent measures with already-established reliability and validity: 1) the American College Health Association-National College Health Assessment II (ACHA-NCHA II); 2) the Center for Epidemiologic Studies Short Depression Scale-10 (CESD-10); 3) the Duke–UNC Functional Social Support Questionnaire (FSSQ); and 4) the International Physical Activity Questionnaire (IPAQ)–Short Form.

ACHA-NCHA II. The ACHA-NCHA II is a nationally recognized, valid, and reliable survey used to collect data on several health outcomes.[10] The survey was derived from the original NCHA, which was developed to assess the health habits, behaviors, and perceptions of college students to create healthy campuses. The ACHA-NCHA II can be administered *via* the internet and comprises health-related questions that are similar to other commonly-used surveys used to assess health status among the general population, thereby influencing our choice to use it in this study of middle-aged persons. Seven questions from the ACHA-NCHA II were used to test the following dependent variables:

- tobacco and alcohol use in the last 30 days (yes/no)
- servings of fruits and vegetables per day [1 (*0 servings*) to 4 (*5 or more servings*) scale]
- disability or medical condition that limits physical activity (*yes* or *no*)
- level of stress (0 = *no stress*, to 4 = *tremendous stress*)
- physician diagnosis of an illness in the last year *related to physical inactivity* (ie, diabetes, high cholesterol, high blood pressure (*yes* or *no*).

Additional questions included perception of their general health status (0 = *don't know*, 1 = *poor,* to 5 = *excellent*) and self-reported weight status (0 = *very underweight* to 4 = *very overweight*).

CESD-10 Scale. The CESD-10 scale assessed the presence of depressive symptoms among the participants. This short form of the CESD demonstrates strong agreement with the full-length, 20-item version (kappa = .97), along with high internal consistency (r = .84), reliability (r = .71), and 12-month stability (r = .59).[11] The final score ranges from 0 to 30, with a score of 10 or greater indicative of clinical depression.

FSSQ. The FSSQ is an 8-item instrument that measured the strength of the participant's social support network.[12] Reliability and validity of the scale has been previously established.[13] The overall average score of social support is obtained from the average of all 8 item scores, with higher scores indicating greater perceived social support.

IPAQ–Short Form. The IPAQ–Short Form and long forms were developed for population surveillance of physical activity and to provide a set of well-developed instruments that can be used internationally to obtain comparable estimates of physical activity. Reliability and validity of the IPAQ has been demonstrated across 12 countries by the International Consensus Group on Physical Activity Measurement.[14] The scoring of the IPAQ short and long forms has been previously described.[15] Total MET-min·week^{-1} of reported activity is then used to categorize participants into 3 categories: *LOW* (<600 MET-min·week^{-1}), *MODERATE* (≥600 to 2999 MET-min·week^{-1}), or *HIGH* (≥3000 MET-min·week^{-1}). In addition, hours per day of sitting was queried.

In addition to standard demographic information, self-reported data on height and weight, blood pressure, and multivitamin/mineral use were collected. The body mass index (BMI; kg·m^{-2}) was calculated and used to categorize participants as *underweight* (<18.5 kg·m^{-2}), *normal weight* (18.5–24.9 kg·m^{-2}), *overweight* (25–29.9 kg·m^{-2}), or *obese* (≥30 kg·m^{-2}).[7] Participants also entered their city, county, state, and zip code to determine the degree of urbanization of the county in which the participants reside.[16] The 9 categories listed by the USDA were grouped into 2 categories: metropolitan (categories 1–3) and nonmetropolitan (categories 4–9). Furthermore, dog owners were asked the breed of their dog(s), the number of dogs owned, the weight(s) of the dog(s), and the overweight status (yes or no) of the dog. The question—"Who, if anyone, usually walks or jogs with your dog(s)?"—identified those who did or did not walk their dogs. Dog walkers were then asked about time

spent walking the dog (min·week^{-1}) and the frequency of walking the dog per week.

Statistical Analyses

Descriptive statistics (mean ± SD; %) first were generated on all study variables. Differences in mean values of the physical activity and health-related variables were compared among the 3 study groups using analysis of variance (ANOVA). To generate cross-sectional estimates of relative risk associated with regular dog walking, multivariable logistic regression next was used to generate odds ratios and 95% confidence intervals (95%CI). For this purpose, dog walkers (DW) were considered the reference group and the odds of the various health risk outcomes among those not owning (NDO) or walking (NDW) a dog were assessed relative to them. Self-reported tobacco and alcohol use in the last 30 days was coded 1 if yes and coded 0 if no. Similarly, low physical activity was defined as an IPAQ score < 600 MET-min·wk^{-1} (coded as 1 or 0) and unhealthy body weight was defined as a reported BMI > 25 kg·m^{-2} (coded 1 or 0). Reported physician diagnosis of type 1 or type 2 diabetes, hypertension, and high cholesterol were coded 1 if present and 0 if not. Depression (coded 1 or 0) was defined as a CESD score ≥ 10. Since MODERATE to HIGH volumes (MET-min·wk^{-1}) of physical activity was considered an important covariable in this analysis, the dichotomized IPAQ score (< / ≥ 600 MET-min·wk^{-1}; LOW = 0 and MOD/HIGH = 1) was included, along with age, in the logistic regression modeling. The SPSS Version 17.0 for Windows statistical package was used to perform all statistical analyses.

Results

A total of 916 of 963 participants completed the survey, yielding a response of 95%. The demographic characteristics of the study sample are summarized by study group in Table 1. The age of the population ranged from 18 to 85 years with a mean age of 39 ± 13 years. Overall, the sample was primarily female, Caucasian, of higher educational attainment, and lived in a metropolitan area. Interestingly, there was at least 1 participant from each of the 50 states represented in the sample. Approximately 60% of the participants owned dogs and of those owners nearly 75% reported that they regularly walked their dog.

Table 1 Sociodemographic Characteristics of the Study Population

	Total (N = 916)	NDO (n = 380)	NDW (n = 137)	DW (n = 399)
Age (yrs)	40 ± 13	39 ± 14	42 ± 14	40 ± 13
% female	78	70	83	84
% Caucasian	86	81	90	90
% ≥ college	68	72	59	67
% metropolitan area	94	95	93	93

Abbreviations: NDO, not dog owners; NDW, not dog walkers; DW, dog walkers.

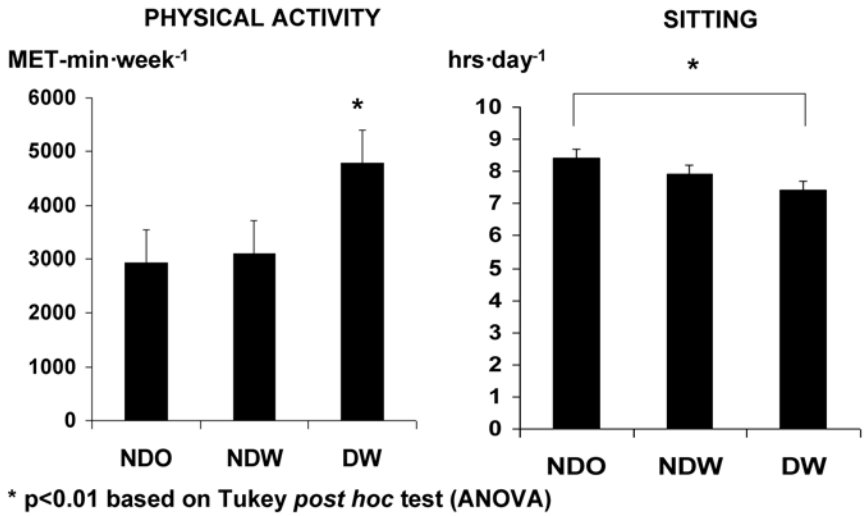

Figure 1 — Reported physical activity and sitting behaviors.

Dog walkers reported a dog walking volume of about 300 min·week^{-1} and this is reflected in their significantly greater levels of total physical activity compared with those who did not own or did not walk a dog (Figure 1).

With regard to general health characteristics (Table 2), those who did not own or who did not walk their dogs had a significantly greater relative body weight ($P <$ .001), and a poorer reported health status than their peers who regularly walked their dogs ($P < .01$). We observed no differences among the groups, however, in reported systolic or diastolic blood pressure. Although levels of perceived stress were similar among the groups, dog owners reported greater social support scores (4.2 ± 0.8 and 4.1 ± 1.0 for DW and NDW, respectively) compared with those who did not own a dog (4.0 ± 0.9; $P < .01$).

Figure 2 presents the unadjusted relative odds of several risk indicators from *Healthy People 2010*. As indicated, those who did not own [OR = 3.35; 95%CI (2.23–5.05)] or did not walk their dog [OR = 5.28; 95%CI (3.24–8.60)] had a significantly greater odds of achieving less that 600 MET-min per week of physical activity compared with dog walkers. Moreover, those who did not own a dog had nearly a 2-fold greater odds [OR = 1.92; 95%CI (1.45–2.56)], while those who did not walk their dog had a 60% higher odds [OR = 1.58; 95%CI (1.07–2.33)] of reporting an unhealthy body weight (BMI > 25 kg·m^{-2}) relative to dog walkers. Finally, those who did not own a dog were nearly twice as likely to use tobacco than those who regularly walked their dog [OR = 1.89; 95%CI (1.31–2.73)].

In the multivariable logistic regression modeling, the robust independent benefits of moderate to high volumes of weekly physical activity to most of the chronic conditions are clear. Indeed, the odds of diabetes were over 60% lower [OR = 0.35; 95%CI (0.18–0.68), the odds of hypertension over 50% lower [OR = 0.47; 95%CI (0.29–0.77)], and those of depression over 40% lower [OR = 0.58; 95%CI (0.41–0.82)] in those reporting ≥ 600 MET-min·wk^{-1} compared with those reporting lower levels. Table 3 presents the unadjusted and adjusted relative risks associated with the various physical inactivity-related chronic conditions among those who do not own or walk a dog compared with dog walkers. As indicated in the adjusted model (model 2), participants who did not own dogs had 2.5 times the odds of diabetes, nearly double the odds of hypertension and hypercholesterolemia, and 50% higher odds of meeting clinical criteria for depression compared with participants who regularly

Table 2 General Health Characteristics of the Study Population

	Total (N = 916)	NDO (n = 380)	NDW (n = 137)	DW (n = 399)
BMI (kg·m^{-2})	26.7 ± 6.3	27.3 ± 6.4	28.7 ± 7.6	**25.7 ± 5.5**[a]
SBP (mmHg)	116 ± 16	117 ± 18	118 ± 12	115 ± 15
DBP (mmHg)	75 ± 13	77 ± 13	74 ± 11	75 ± 15
Health status (1–5)	3.7 ± 1	3.7 ± 1	3.5 ± 1	**3.8 ± 1**[b]

Abbreviations: NDO, not dog owners; NDW, not dog walkers; DW, dog walkers.

[a] $P < .001$ DW< NDO and NDW.

[b] $P < .01$ DW > NDW.

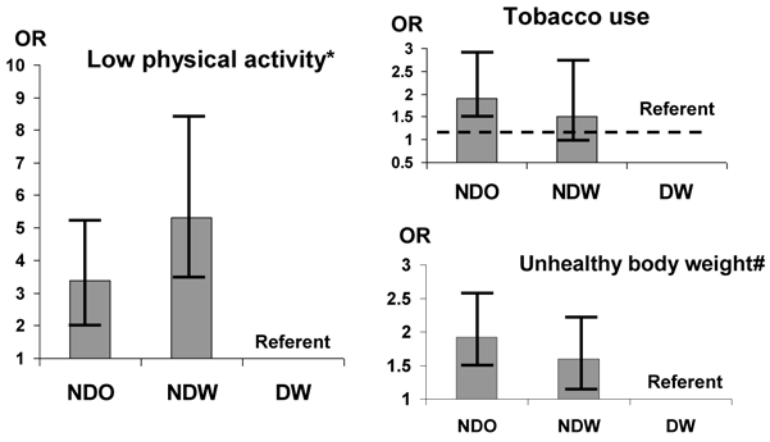

Figure 2 — Relative odds (95% CI) of various risk behaviors.

Table 3 Relative Odds (95% CI) of Reporting a Chronic Condition

	NDO (n = 380)		NDW (n = 137)		DW (n = 399)	
	Model 1	Model 2*	Model 1	Model 2*	Model 1	Model 2*
Diabetes[a,b]	**3.1 (1.5–6.5)**	**2.5 (1.2–5.5)**	**2.1 (1.8–5.6)**	1.1 (0.4–3.2)	1.00	
Hypertension[a]	**1.9 (1.2–3.0)**	**1.7 (1.0–2.8)**	**2.4 (1.4–4.3)**	1.7 (0.9–3.2)	1.00	
High cholesterol[a]	**1.7 (1.1–2.7)**	**1.7 (1.1–2.8)**	**1.7 (1.0–3.1)**	1.3 (0.7–2.6)	1.00	
Depression[c]	**1.6 (1.2–2.2)**	**1.5 (1.1–2.1)**	1.2 (0.8–1.9)	1.1 (0.7–1.7)	1.00	

Abbreviations: NDO, not dog owners; NDW, not dog walkers; DW, dog walkers.

*Model 2 adjusted for age and moderate/vigorous activity.

[a] Based on reported physician diagnosis.

[b] Type 1 or type 2 diabetes.

[c] CES-D score ≥ 10.

walked their dogs. These findings are statistically significant and independent of age and moderate-to-higher volume of physical activity. When BMI was added to the statistical models, these associations disappeared, presumably due to the fact that overweight and obesity lie in the biological pathway between physical activity and these chronic conditions.

Discussion

We observed a significantly poorer health profile among people who do not own dogs or do not walk their dog compared with dog owners who regularly walk their dogs. These findings were independent of age and moderate to high volumes of physical activity, suggesting that the lower-intensity activity associated with dog walking offers unique benefits to health. Our data are corroborated by those of others observing positive associations between dog ownership and physical activity,[17–19] weight status,[20] and cardiovascular risk factors.[21] Other investigators, however, have described no such associations,[22,23] and this may be attributable to methodological differences among the studies.

Much of the research examining the relation of dog ownership to cardiovascular risk benefits[21] and survival outcomes[24] have focused on the modulating influence of various psychosocial factors such as bonding, stress reduction, and social interaction. Dog owners tend to report lower levels of mental stress,[25] and fewer feelings of loneliness and depression,[26] compared with those not owning a dog. Furthermore, dogs may serve as a buffer to stressful life events. Allen and colleagues[27] observed that dog owners demonstrated significantly blunted sympathetic responses to a stress task when their pet was present, compared with the presence of their spouse or a friend. Finally, dog owners demonstrate higher self-esteem than those not owning a dog, presumable due to the fact that dogs can serve as a catalyst for social interaction and social support.[28] Participants in the current study who did not own a dog experienced significantly greater odds of meeting criteria for clinical depression, and while scores of perceived stress were similar among the 3 participant groups, dog owners indeed reported significantly higher social support scores compared with those not owning a dog. The benefits of social support to mental health and longevity have been well documented.[29]

More recent studies have focused on the specific relationship between dog ownership and physical activity levels. The Dog and Physical Activity (DAPA) tool[30] was developed for this purpose, and is grounded in the theory of planned behavior. For example, because dog owners have a responsibility to care for the health and well-being of their dog, dog walking is considered a *purposeful activity*, thus helping to promote habitual physical activity behaviors. The majority of the research examining dog walking and physical activity has been performed in Australia where, similar to the U.S., approximately 60% of the population is overweight.[31] Not surprisingly, these studies report a positive relationship between owning a dog and physical activity,[18,32,33] as well as a reported

increase in physical activity upon obtaining a dog.[34] Findings of higher levels of physical activity among those who do and do not own a dog are corroborated by studies performed in the United States,[19,35] Canada,[17] Japan,[36] and the United Kingdom.[37] In fact, a longitudinal study by Serpell[37] reported that among 71 persons recently acquiring a pet, reported health status and physical activity level improved significantly by 6 months and this improvement lasted up to 10 months. Our results extend those of previous studies as we focused not only on dog ownership and physical activity, but we compared a number of risk behaviors and health outcomes between dog owners who did and did not walk their dogs. Indeed, our findings suggest a clear pathway between the lower physical activity levels observed in those who did not own or do not walk a dog, and higher odds of overweight and consequent inactivity-related chronic conditions such as diabetes, hypertension, and hypercholesterolemia, independent of the benefits of moderate-to-higher volume activity.

There appear to be health benefits specific to the physical activity pattern of dog walking—that is, frequent bouts of lower to moderate intensity walking with several intervals of standing. Indeed, the metabolic health benefits of simply breaking up prolonged sedentary time with short bouts of activity have recently been described.[5] An important mechanism in this pathway may be the interruption of key molecular deregulatory patterns associated with prolonged sitting, such as decreased lipoprotein lipase (LPL) activity in skeletal muscle.[6,7,38] Moreover, simply getting up from a chair involves a number of muscles in the lower leg important to standing and maintaining an upright posture, and frequent activation of these (red oxidative) fibers with standing may be an important factor in promoting LPL binding activity.[39]

Our results should be interpreted with caution. As this analysis was cross-sectional, the temporal relation between dog walking and general health cannot be established. Indeed, it is quite possible that healthy people may be more likely to own pets. All of the health conditions reported in this analysis were self-reported with no validation against medical records. We propose, however, that any misclassification of disease status would be nondifferential among the 3 study groups (as everyone was informed about the nature of the study). In addition, due to the self-selected nature of the study population and the use of the internet to recruit subjects and to collect data, the generalizability of the findings are limited primarily to higher-educated white women living in metropolitan areas. On the other hand, by having dog owners recruit a friend or neighbor not owning a dog as their "non-exposed" control, we were able to match indirectly on several important sociodemographic factors related to the risk and health outcomes of interest, thereby preserving the integrity (internal validity) of the findings. Finally, due to the small number of outcome events among dog walkers, we lacked the statistical power to determine any dose-response association between volume of dog walking ($min \cdot wk^{-1}$) and disease risk.

Nonetheless, our results indicate that dog walkers are more physically active and considerably healthier than their peers who do not own or do not walk their dog. Because of these health benefits, dog walking should be encouraged within communities as a method of promoting and sustaining a healthy lifestyle. In addition, larger longitudinal studies using randomized controlled designs are needed to determine the dose-response effectiveness of this type of intervention appropriately.

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