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Physical Activity, Weight Status, and Neighborhood Characteristics of Dog Walkers

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Abstract

Objective—This study examined how demographics, physical activity, weight status, and neighborhood characteristics varied among households with and without dogs.

Method—Participants aged 20 to 65 years (N = 2199, 52% male, 75% white, Mean age = 45) were recruited from 32 neighborhoods in the Seattle, WA and Baltimore, MD regions during 2002 – 2005. Dog ownership, dog walking, education, height, weight, and family income were self-reported. Minutes of moderate to vigorous physical activity (MVPA) were measured objectively by 7-day accelerometry.

Results—Dog walking was associated with a higher proportion of participants who met national recommendations for MVPA (53%) when compared to those who had but did not walk their dog (33%) and to non-dog owners (46%). There were significantly fewer obese dog walkers (17%) when compared to both owners who did not walk their dogs (28%) and non-owners (22%). Dog owners who walked their dogs were more likely to live in high-walkable neighborhoods when compared to dog owners who did not walk their dogs.

Conclusion—Dog walking may promote physical activity and contribute to weight control. Dog walking appears to be a mechanism by which residents of high-walkable neighborhoods obtain their physical activity.

Keywords

walking; exercise; obesity; built environment

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Introduction

Given that over 60% of the adult U.S. population is overweight, over 30% is obese (Ogden et al., 2006), and the prevalence rate of type 2 diabetes is 25% in some racial/ethnic groups (CDC, 2007), improved approaches to physical activity promotion and weight gain prevention are needed. Morgan (2001) suggested that a greater emphasis on promoting "purposeful" physical activity could improve outcomes. Purposeful physical activity in Morgan's model is activity that is *not* exercise for improving fitness, but activity done in the process of achieving another goal such as walking to work instead of driving. Dog walking is an example of purposive physical activity and has been examined as a mechanism for promoting moderate physical activity (Bauman et al., 2001; Brown et al., 2006; Ham & Epping, 2006; Thorpe et al., 2006a; Thorpe et al., 2006b), as well as an effective method of weight loss for both pets and their owners (Becker & Kushner, 2006; Chan et al., 2005).

Neighborhood walkability has been consistently related to active transportation and overall physical activity (Frank et al., 2007), but its relationship to dog walking is unclear. The only published study (in abstract form only) that was found by Bauman, Sugiyama, and Owen, (2007) reported that among Australian adults there was an interaction of neighborhood walkability and socioeconomic status (SES) such that those least likely to walk their dogs lived in the poorest and least walkable neighborhoods. The current study used a population-based sample of adults to examine how dog ownership, participant characteristics, and neighborhood walkability interacted to explain objectively monitored physical activity levels and weight status.

Methods

Study Design

The Neighborhood Quality of Life Study (NQLS), conducted from 2002 – 2005, was an observational epidemiologic study designed to compare multiple health outcomes among residents of neighborhoods stratified based on their "walkability" characteristics and median household income. The study was conducted in two metropolitan areas in the U.S. were chosen based on the availability of detailed parcel-level and road network data that could be uploaded into a Geographic Information System (GIS) as well as wide variability in walkability. King County, WA region (Seattle, WA metropolitan area) and the Baltimore, MD/Washington DC region met these criteria.

Participants were selected from 32 neighborhoods (16 in each of the two U.S. regions). Neighborhoods were defined as a cluster of contiguous census block groups. The neighborhoods were systematically selected to represent high and low categories of both walkability and neighborhood income, creating four neighborhood "types": high walkable/high income, high walkable/low income, low walkable/high income, and low walkable/low income.

Walkability describes the ability of a resident to walk from home to nearby destinations; key features of a high walkable neighborhood are mixed land use, connected streets, and high residential density (Frank & Engelke, 2003; Saelens et al., 2003). For the current study, a multi-component walkability index was derived from GIS to guide neighborhood selection (see Frank et al., 2006 for the details of the index computation).

Neighborhood income was determined for each block group in the regions using U.S. census median household income (www.census.gov). Census block groups with median household income values <$15,000 or >$150,000 were not included to avoid income outliers. The second, third, and fourth deciles within a region constituted the "low income" category, and the seventh,

eighth, and ninth deciles within a region made up the "high income" category. The fifth and sixth deciles were omitted to create a more pronounced separation between low and high income neighborhoods.

Individual Participants

A total of 8504 eligible "potential" participants were identified within the 32 selected neighborhoods as described above. Participant eligibility was defined as being between the ages of 20 – 65 years, not residing in a group living establishment (e.g. nursing home, dormitory), ability to complete written surveys in English, and absence of a medical condition that interfered with the ability to walk. Participants were recruited via telephone and mail using contact information obtained from a commercial marketing company. Of those contacted, 30% provided informed consent and agreed to have a survey and accelerometer mailed to them, and 26% completed a survey and wore the accelerometer. This resulted in 2199 participants available for analyses. Upon receipt of the survey and accelerometer, a $20 incentive payment was mailed to each participant. The study was approved by the Institutional Review Board at both San Diego State University and the Cincinnati Children's Hospital Medical Center.

Measures

Dog walking—Participants were asked if they had a dog at home and if they did have a dog, they were asked how much time (hours and/or minutes) they spent walking their dog in the past week. These items were obtained from a previous study (Bauman et al., 2001).

Physical activity—Participants were asked to wear an accelerometer (Actigraph®, Manufacturing Technology Incorporated, model 256; Fort Walton, FL) for seven consecutive days for at least 10 hours per day. The Actigraph® is a small, electronic device worn on a belt around the waist. It records movement due to physical activity as activity counts for every minute of the day up and has been extensively validated in many populations (see Welk, 2002 for a review).

Moderate to vigorous physical activity was determined by using accelerometer activity count "cut points" established for the Actigraph® when assessing adult physical activity in free living conditions (Freedson & Miller, 2000). These cut-point activity counts were applied to raw accelerometer data and total minutes at or above the MVPA threshold for the week of measurement were obtained for each participant. Total minutes of MVPA per week were then divided by the number of valid days, and the outcome variable was average minutes of MVPA per day.

Demographics and Body Mass Index (BMI)—Age, gender, highest level of household education, and race/ethnicity were self-reported. Participants self-reported their height and weight. BMI was calculated as: weight (kg)/[height (m)] ^{2}. Adults' self-report of weight and height are routinely used in epidemiological research (Stewart, 1982; Smith et al., 1989) and are strongly correlated with objectively measured values ($r > .90$; Stewart, 1982; Wing et al., 1979).

Analyses

All analyses were conducted in SPSS version 13 (SPSS Inc., Chicago, IL). Summary statistics were calculated for all variables using mean ± standard deviation for continuous variables and percentages for categorical variables. In addition to the two design variables of neighborhood walkability and neighborhood income, several other categories of participants were created for the analyses. The first category was dog ownership and dog walking status based on whether or not a participant owned a dog and reported walking their dog more than 0 minutes per week. Categories for this variable included: non-owner, owner/non-walker (reported owning a dog

but 0 minutes per week walking it), or owner/walker (reported owning a dog and walking it > 0 minutes per week). The second categorization was weight status using BMI defined as normal weight (BMI < 25), overweight (BMI 25–29.9), or obese (BMI ≥ 30). Third, based on accelerometer MVPA, participants were categorized as meeting or not meeting the public health recommendations for MVPA (Haskell et al., 2007) if they engaged in an average of 30 minutes or more of MVPA per day (Hayden-Wade et al., 2003). Finally, participants were grouped into non-Hispanic white and "other" categories of ethnicity; the sample sizes within ethnic groups were not large enough to analyze data separately for each category.

Initially multivariate analyses were conducted to determine the contribution of study variables to three outcomes: average minutes of MVPA/day, meeting ACSM/CDC MVPA guidelines (yes, no) and weight classification (normal weight, overweight, obese). Variables in the multivariate models included gender, ethnicity (white or non-white), education, household income, neighborhood income, and age.

Because there were no interactions among these variables these results are not presented in the paper. Instead single variate analyses are presented for the results of the study to highlight individual factors contributing to physical activity and weight status of study participants. Independent variables for these analyses were dog owner/walker category, neighborhood walkability, and neighborhood income. Continuous variables were analyzed using one way Analyses of Variance (ANOVA) and categorical variables were analyzed using the Chi-Squared statistic for proportional data. Post-hoc tests for differences between groups were conducted if a main effect was found using simple pair-wise comparisons.

Results

Participants

Overall, participant characteristics included a mean age of 45 ± 11 years and 52% were male, 75% were Caucasian, 65% completed a college degree, 56% were married, and 43% had annual household incomes of $70,000 or more. Most participants (57%) were either overweight or obese and 46% of participants met MVPA recommendations. Overall, 28% of participants reported owning a dog. Of those who owned a dog, 30% said they did not walk their dog, while the remaining 70% of dog owners reported walking their dogs for an average of 180 ± 186 minutes in the past week.

Dog Ownership/Walking

Table 1 shows characteristics for participants presented by dog ownership/walking category. Dog owners/walkers were more likely to be white and live in higher income neighborhoods than both non-owners and owners/non-walkers. Dog owners, regardless of whether they walked their dogs, were more likely than non-owners to be white and older, live in higher income neighborhoods, and have higher self-reported incomes. There were no differences among dog owner/walker groups with respect to gender and education.

Results for weight status and meeting ACSM/CDC MVPA recommendations varied between the groups of owners/walkers. Owners/walkers had the lowest rates of obesity and owners/non-walkers had the highest rates of obesity. This pattern was different for rates of overweight, with owners/walkers having higher rates of overweight when compared to non-owners. Owners/walkers had significantly higher average minutes/day of accelerometer-measured MVPA than both non-owners and owners/non-walkers, with the latter two groups not differing. The results were somewhat different when considering the outcome of meeting MVPA recommendations. Owners/walkers were more likely to meet guidelines when compared to both owners/non-walkers and non-owners. Moreover non-owners were more likely to meet

guidelines than owners/non-walkers. Finally, non-owners were more likely to live in high walkable neighborhoods than either group of dog owners, while dog owners/walkers were more likely to live in high walkable neighborhoods than owners/non-walkers.

Discussion

The present study provided some evidence that dog walking could be a promising strategy for promoting physical activity and controlling obesity. Dog walkers were more likely to meet national recommendations for MVPA (53%) when compared to dog owners who did not walk their dogs (33%) and to non-dog owners (46%). This finding is likely robust given that MVPA was assessed objectively with an accelerometer. In another potential health effect of dog walking, there were significantly fewer obese dog walkers (17%) when compared to both owners who did not walk their dogs (22%) and non-owners (28%).

The percent of minority participants was lowest among dog walkers, and people who owned a dog were more likely to be white than people who did not own a dog. This has been found in other research on dog ownership/walking (Thorpe et al., 2006a). Dog owners had higher incomes than non-owners, but there was no income difference between owners who did or did not walk their dogs. The expense of owning a dog may prohibit low income and ethnic minority populations from benefiting from dog walking as a strategy to adopt a healthy lifestyle. To overcome this barrier, dog sharing programs could be implemented by humane societies and animal shelters in low-income neighborhoods. Low income and minority populations could volunteer to help these organizations by walking dogs but not have to incur the expenses associated with owning a dog.

Dog walkers were more likely to live in high-walkable neighborhoods when compared to dog owners who did not walk their dogs, independent of neighborhood or personal income. There may be several reasons for this finding. First, people are more likely to walk for transportation in high-walkable neighborhoods (Frank et al., 2006; Heath et al., 2006; Saelens et al., 2003), so dog owners could walk their dogs while doing other errands. This would be an example of Morgan's (2001) purposeful physical activity model. Second, high-walkable neighborhoods usually have sidewalks and other pedestrian facilities, so dog owners may have stronger feelings of security and enjoyment while walking in high-walkable neighborhoods (Frumkin, 2003). Third, dog owners in low-walkable neighborhoods are likely to live in single family homes with larger yards which provide a place for dogs to be active without needing to be walked (Frank & Engelke, 2003; Saelens et al., 2003). A recent study found that owning but not walking a dog was due to a variety of reasons including the ownership of small toy breeds, another family member being responsible for walking the dog, and a perception that their dog did not provide the motivation or the social support they needed to walk (Cutt, Giles-Corti, & Knuiman, 2007). Fourth, there is evidence that, to some extent, people who enjoy walking self-select into more walkable neighborhoods (Frank et al., 2007; Handy et al., 2006). Similarly, it may be that dog owners who want or need to walk their dog would choose to live in a more walkable neighborhood.

Although the study was designed to produce a sample diverse in income and neighborhood walkability, the sample was primarily well-educated and white. Thus, findings may not apply to samples with other characteristics. An important limitation was the cross-sectional study design. It is not possible to determine whether living in a walkable neighborhood led to more people walking their dogs or whether dog walking is the cause of observed differences in physical activity and obesity rates among groups of dog owners/walkers. Conclusions regarding different rates of obesity for dog owners/walkers and dog owners/non-walkers should be treated with caution as the sample sizes for these groups of participants were very small relative to the overall sample size. Unfortunately no data were collected about whether a family

dog was walked by another family member or other reasons why people did not walk their dogs. Finally, although height and weight were self-reported, it is unlikely that self-report error would differ between the groups of dog owners/walkers in the study. Similarly wearing an accelerometer may have influenced participants to engage in more physical activity, however it is unlikely that this effect would be different across the categories of dog ownership/walking.

Conclusions

Current findings, combined with results of other recent studies (Bauman et al., 2001; Bauman et al., 2007; Becker & Kushner, 2006; Chan et al., 2005; Cutt et al., 2007; Thorpe et al., 2006a & 2006b), provide suggestive evidence that promoting dog walking could address physical inactivity and obesity. Because there is a lack of evidence-based obesity control strategies that can be implemented at the population level (DHHS, 2001), a high priority should be placed on conducting longitudinal studies such as that from Serpell and colleagues (1991) as well as controlled interventions with dog walking promotion as a strategy to increase physical activity and control obesity. Dog walking is a particularly attractive strategy, because dogs need to be walked every day for several years. Our findings provide further support for government policies that encourage construction of walkable communities which promote physical activity (Heath et al., 2006) and lower obesity rates (Papas et al., 2007).

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Table 1

Study characteristics for each category of dog ownership/walking.

Variable	Non-owners (n = 1578)	Owners/Non-walkers (n = 183)	Owners/ Walkers (n = 429)	Significant Differences
% Female	49%	45%	45%	NS
% Non-White	28%	22%	15%	OW<ONW<NO
Education				NS
Less than college	34%	41%	35%	
College graduate	35%	31%	34%	
Graduate school	30%	28%	31%	
Household Income				
Low	16%	7.5%	9%	NO> OW>ONW
Middle	41%	31%	30%	NO> OW=ONW
High	43%	61.5%	61%	NO< OW=ONW
Neighborhood Income (% High)	49%	55%	61%	NO<ONW<OW
Age (years)	45 ± 11	47 ± 9	46 ± 10	OW=ONW>NO
Accelerometer MVPA (minutes/day)	33 ± 24	27 ± 21	35 ± 24	OW>ONW=NO
Meeting MVPA Recommendations (% Yes)	46%	33%	53%	OW>NO>ONW
Weight Classification				
% Overweight	34%	34%	43%	NO<ONW<OW
% Obese	22%	28%	17%	OW<NO<ONW
Neighborhood Walkability (% High)	53%	32%	47%	NO>OW>ONW

Participants were recruited from 32 neighborhoods in the Seattle, WA and Baltimore, MD regions during 2002 – 2005. Data are presented as means ± standard error for continuous variables and as percentage (number of participants) for categorical variables. Omnibus F and overall Chi Squared tests were significant at $p \leq .002$. Post-hoc differences between categories of dog ownership/walking are significant at < .05. NS = not significant; NO =non-owner; OW = owner/walker; ONW = owner/non-walker