March, 2010

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Published in final edited form as:
Am J Prev Med. 2011 March ; 40(3): 334–337. doi:10.1016/j.amepre.2010.11.007.

Dog Ownership and Adolescent Physical Activity

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Abstract

Background—Positive associations between dog ownership and adult health outcomes have been observed, but research involving youth is lacking.

Purpose—The purpose of this study was to assess the relationship of family dog ownership to adolescent and parent physical activity, weight status, and metabolic risk factors.

Methods—Data were collected on dog ownership in 618 adolescent/parent pairs between 9/2006 and 6/2008 and analyzed in 2010. Adolescent physical activity was assessed by ActiGraph accelerometers. Trained staff measured blood pressure, height and weight, and percentage body fat was calculated by impedance. A subsample of adolescents (n=318) opted for a fasting blood draw used to derive a metabolic risk cluster score. Parents and adolescents provided consent and assent, respectively.

Results—Adolescents' mean age was 14.6±1.8 years and 49% were male. White and higher SES adolescents were more likely to own a dog. In models adjusted for age, puberty, gender, race, total household members and SES, adolescent physical activity (mean counts min^{-1} day^{-1}) remained significantly associated with dog ownership (β=24.3, SE=12.4, p=0.05) while the association with minutes of moderate-to-vigorous physical activity day^{-1} became nonsignificant (β=2.2, SE=1.2, p=0.07). No significant results were observed for other adolescent characteristics.

Conclusions—Dog ownership was associated with more physical activity among adolescents. Further research using longitudinal data will help clarify the role that dog ownership may have on adolescent physical activity.

INTRODUCTION

Physical inactivity is a major public health problem1–3 and may play a substantial role in the etiology of youth obesity and type II diabetes.4–6 Recently, dog ownership has been positively associated with health-related factors among middle-aged and older adults, including physical activity,7–12 weight,9 and mental health.13–16 However, there is little information about the associations between dog ownership and youth health behaviors and

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No financial disclosures were reported by the authors of this paper.

outcomes. The family dog may provide external motivation for physical activity similar to having a walking or workout partner—a common method used to increase exercise adherence. The purpose of this study was to determine the relationship of family dog ownership to adolescent physical activity, screen time and related health outcomes. It was hypothesized that dog ownership would be positively associated with physical activity and negatively associated with weight status, screen time and other health outcomes.

METHODS

Samples

Adolescent participants were enrolled in one of two cohort studies: (1) the Identifying Determinants of Eating and Activity Study (IDEA, 2006–2007) and (2) the Etiology of Childhood Obesity Study (ECHO, 2007–2008). Both studies were conducted within the metropolitan area of Minneapolis–St. Paul, Minnesota, and included identical measurement protocols. These samples were combined in order to provide a larger and more diverse sample. Both studies have been described previously.[17–18]

Measures

Data were collected during a 2-hour clinic visit with an optional supplemental study including a fasting blood draw. All study protocols were approved by the University of Minnesota IRB.

Independent variable—*Dog ownership* was self-reported by parents by asking “How many dogs are in your home?” Response options of “0”, 1”, “2”, and “3 or more” were recoded to “none” and “one or more”.

Dependent variables—The ActiGraph accelerometer, model 7164 (ActiGraph, LLC, Pensacola, FL) was used to collect 7 days of physical activity data using standard right hip placement and 30-second epochs (data collection intervals).[19,20] ActiGraph data were reduced using the ActiProcess software 21 which employs imputation based on the Expectation Maximization algorithm. Summary physical activity variables were calculated using the Freedson age-specific count cutoffs 22 distinguishing moderate- and vigorous-intensity based on age-adjusted METs.[23,24] Mean accelerometer counts per minute were also calculated as a measure of total movement.

Adolescent screen time behavior was assessed via self-administered surveys using items adapted from previous studies to determine mean screen time hours on weekdays and weekends.[25–27]

Covariates—Adolescents reported their gender and age; parents reported the number of people living in the household, if their child qualified for free or reduced priced lunch (FRL, Y/N), and highest level of education among the adults living in the household (≥College degree, Y/N). Adolescents completed the self-report Pubertal Development Scale (Cronbach’s $\alpha = 0.77$)[28] to control for puberty’s confounding effects when examining associations with BMI and body fat.

Analysis

Analyses were conducted in 2010 using SAS v. 9.1 (SAS Institute, Cary, NC). Only one parent/adolescent dyad from each household was included in these analyses. Unadjusted analyses included t-tests to determine differences by dog ownership category and Spearman correlations to determine bivariate associations between dog ownership and dependent variables. Subsequent regression analyses were conducted using those variables with $p<0.05$

in correlational analyses. PROC GENMOD (General Estimating Equations) was used for linear regression, adjusting for covariates, the study sample (IDEA vs ECHO), and accounting for possible clustering by school. Interactions were tested to determine if the relationship between dog ownership and the dependent variables was modified by adolescent gender and age.

Results

After excluding dyads with missing data, the final sample was n=618. Adolescents who were white and/or not receiving FRL were more likely to be from dog-owning families ($p<0.05$ and $p<0.01$, respectively). Mean daily minutes of Moderate to Vigorous Physical Activity (MVPA) was significantly greater for adolescents who owned a dog ($p<0.05$). See Table 1.

Table 2 shows both measures of physical activity (accelerometer counts per minute and MVPA) were positively correlated with dog ownership ($p<0.05$). Therefore, these variables were evaluated in an adjusted regression model.

Mean daily accelerometer counts per minute remained significantly associated with dog ownership (B = 24.3, SE = 12.4, p = 0.05) after controlling for all potential confounders. The association between dog ownership and mean daily minutes of MVPA was no longer significant (B = 2.2, SE = 1.2, p = 0.07) after controlling for confounders. There were no significant ($p>0.05$) interactions.

DISCUSSION

A small but positive association was observed between dog ownership and adolescent total activity (mean daily ActiGraph counts per minute) that remained significant after controlling for a wide range of demographic confounders. Several previous studies observed similar positive associations between dog ownership and adult physical activity.11 Children and adolescents may not have the primary responsibility of walking the dog but may actively play with the family dog, thus contributing to their overall minutes engaging in physical activity. However, dog walking behavior and active play with the family dog were not assessed in this study and need to be studied further. Although small, the magnitude of these associations should be considered within an ecologic perspective where physical activity is affected by multiple factors at several levels of influence.

The cross-sectional nature of this study does not allow us to determine causality between dog ownership and activity. Therefore, families with more-active children may be more likely to get a dog as a pet, rather than dogs causing youth to be more active. Longitudinal data measuring physical activity and other health outcomes before and after dog acquisition in large, representative samples are needed to address this question. Several small longitudinal studies have indicated increases in adult walking and physical activity following dog acquisition,29–31 but there have been no comparable studies with youth.

In addition, this study did not assess factors that could potentially moderate the association between physical activity and dog ownership, such as the size and breed of the dog, the home and neighborhood environments, the role of specific family members in walking and/or actively playing with the dog, and the level of attachment to the dog. Furthermore, the relatively healthy, homogeneous sample may have limited the ability to see stronger associations that might be more apparent with a more diverse population.

CONCLUSION

A positive association was observed between family dog ownership and objectively measured adolescent physical activity. In contrast, dog ownership was not significantly associated with youth sedentary behavior. This study is among the first of its kind to examine such relationships among youth. Additional research is needed to further understand the associations between dog ownership and health.

Acknowledgments

The authors thank the participating families and our funding sources: NCI's Transdisciplinary Research in Energetics & Cancer Initiative (NCI Grant 1 U54 CA116849-01), Examining the Obesity Epidemic Through Youth, Family & Young Adults (PI: Robert Jeffery, PhD).

References

1. CDC. Youth Risk Behavior Surveillance – U.S., 2007; Morb Mortal Weekly Rep, MMWR. 2008. p. 109
2. Pate RR, Wang CY, Dowda M, Farrell SW, O'Neill JR. Cardiorespiratory Fitness Levels Among U.S. Youth 12 to 19 Years of Age: Findings From the 1999–2002 National Health and Nutrition Examination Survey. Arch Pediatr Adolesc Med. 2006; 160(10):1005–1012. [PubMed: 17018458]
3. Strong WB, Malina RM, Blimkie CJR, et al. Evidence Based Physical Activity for School-age Youth. J Pediatr. 2005; 146(6):732–737. [PubMed: 15973308]
4. McGavock J, Sellers E, Dean H. Physical activity for the prevention and management of youth-onset type 2 diabetes mellitus: focus on cardiovascular complications. Diab Vasc Dis Res. 2007; 4(4):305–310. [PubMed: 18158700]
5. Patrick K, Norman GJ, Calfas KJ, et al. Diet, physical activity, and sedentary behaviors as risk factors for overweight in adolescence. Arch Pediatr Adolesc Med. 2004; 158(4):385–390. [PubMed: 15066880]
6. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. Med Sci Sports Exerc. 2000; 32(5):963–975. [PubMed: 10795788]
7. Bauman AE, Russell SJ, Furber SE, Dobson AJ. The epidemiology of dog walking: an unmet need for human and canine health. Med J Australia. 2001; 175:632–634. [PubMed: 11837871]
8. Ham, S.; Epping, J. Dog walking and physical activity in the U.S. Prevent Chronic Dis. 2006. http://www.cdc.gov/pcd/issues/2006/apr/pdf/05_0106.pdf
9. Coleman KJ, Rosenberg DE, Conway TL, et al. Physical activity, weight status, and neighborhood characteristics of dog walkers. Prev Med. 2008; 47(3):309–312. [PubMed: 18572234]
10. Brown SG, Rhodes RE. Relationships among dog ownership and leisure-time walking in Western Canadian adults. Am J Prev Med. 2006; 30(2):131–136. [PubMed: 16459211]
11. Cutt H, Giles-Corti B, Knuiman M, Burke V. Dog ownership, health and physical activity: A critical review of the literature. Health & Place. 2007; 13(1):261–272. [PubMed: 16503185]
12. Thorpe RJ Jr. Simonsick EM, Brach JS, et al. Dog ownership, walking behavior, and maintained mobility in late life. J Am Geriatr Soc. 2006; 54:1419–1424. [PubMed: 16970652]
13. Albert A, Bulcroft K. Pets, families, and the life course. J Marriage Fam. 1988; 50:542–552.
14. Demello LR. The effect of the presence of a companion-animal on physiological changes following the termination of cognitive stressors. Psychol Health. 1999; 14:859–868.
15. Garrity TF, Stallones L, Marx MB, Johnson TP. Pet ownership and attachment as supportive factors in the health of the elderly. Anthrozoos. 1989; 3:35–44.
16. Katcher AH. Are companion animals good for your health? Aging. 1982; 331–332:2–8.
17. Lytle LA. Examining the etiology of childhood obesity: The IDEA Study. Am J Comm Psychol. 2009; 44(3–4):338–349.
18. Dengel DR, Hearst MO, Harmon JH, Sirard J, Heitzler CD, Lytle LA. Association of the home environment with cardiovascular and metabolic biomarkers in youth. Preventive Medicine. 2010; 51:259–261. [PubMed: 20637798]

19. Louie L, Eston RG, Rowlands AV, et al. Validity of heart rate, pedometry, and accelerometry for estimating the energy cost of activity in Hong Kong Chinese boys. Pediatr Exerc Sci. 1999; 11(3): 229–239.
20. Trost SG, Ward DS, Moorehead SM, Watson PD, Riner W, Burke JR. Validity of the Computer Science and Applications (CSA) activity monitor in children. Med Sci Sports Exerc. 1998; 30(4): 629–633. [PubMed: 9565947]
21. Catellier DJ, Hannan PJ, Murray DM, et al. Imputation of missing data when measuring physical activity by accelerometry. Med Sci Sports Exerc. 2005; 37(11 Suppl):S555–S562. [PubMed: 16294118]
22. Freedson PS, Sirard J, Debold E, Pate RR, Dowda M, Trost SG, Sallis JF. Calibration of the computer science and applications, inc. (csa) accelerometer. Med Sci Sports Exerc. 1997; 29(5):S45.
23. Harrell JS, McMurray RG, Baggett CD, Pennell ML, Pearce PF, Bangdiwala SI. Energy costs of physical activities in children and adolescents. Med Sci Sports Exerc. 2005; 37(2):329–336. [PubMed: 15692331]
24. Sirard JR, Welk GJ, Heitzler CD, Lytle LA. Youth accelerometer cutoffs for moderate-to-vigorous physical activity: A sensitivity analysis. Med Sci Sports Exerc. 2009; 41(5 Suppl):S314.
25. Gortmaker SL, Cheung LW, Peterson KE, et al. Impact of a school-based interdisciplinary intervention on diet and physical activity among urban primary school children: eat well and keep moving. Arch Pediatr Adolesc Med. 1999; 153(9):975–983. [PubMed: 10482216]
26. Utter J, Neumark-Sztainer D, Jeffery R, Story M. Couch potatoes or French fries: Are sedentary behaviors associated with body mass index, physical activity, and dietary behaviors among adolescents? J Am Diet Assoc. 2003; 103(10):1298–1305. [PubMed: 14520247]
27. Heitzler CD, Lytle LA, Erickson DJ, Sirard JR, Barr-Anderson DJ, Story M. Physical activity and sedentary activity patterns among children and adolescents: A latent class analysis approach. J Phys Act Health. In Press.
28. Petersen A, Crockett L, Richards M, Boxer A. A self-report measure of pubertal status: reliability, validity, and initial norms. J Youth Adolesc. 1988; 17(2):117–133.
29. Cutt H, Knuiman MW, Giles-Corti B. Does getting a dog increase recreational walking? Intl J Behavior Nutr Phys Act. 2008; Vol 5
30. Schofield G, Mummery K, Steele R. Dog ownership and human health-related physical activity: An epidemiological study. Health Promo J Austr. 2005; 16(1):15–19.
31. Serpell J. Beneficial effects of pet ownership on some aspects of human health and behavior. J Royal Soc Med. 1991; 84(12):717–720.

Table 1

Participant health-related physiologic and behavioral measures by dog ownership (n=618); M (SD) or %

	Full sample	0 dogs (47.4%)	1+ dogs (52.6%)	p-value
Gender, % male	49.0	45.4	52.3	0.09
Age	14.6 (1.8)	14.5 (1.8)	14.7 (1.8)	0.72
Race, % white	84.6	81.6	87.4	0.05
% eligible to receive free or reduced-price lunch	11.5	15.4	8.0	0.003
Puberty (n=687)	2.9 (0.7)	2.9 (0.7)	2.9 (0.8)	0.65
Counts/minute/day	383.7 (160.3)	373.5 (163.3)	392.8 (157.3)	0.14
MVPA minutes/day	30.9 (16.9)	29.5 (15.8)	32.1 (17.8)	0.04
Sedentary minutes/day	570.5 (92.7)	573.3 (95.2)	566.1 (90.2)	0.22
Screen time, minutes/day	322.0 (225.9)	330.5 (234.7)	314.3 (217.7)	0.19

Table 2

Spearman correlations between dog ownership (0 vs 1+) and health-related physiologic and behavioral variables

	n	Spearman r	p-value
Counts/minute/day	600	0.080	0.05
MVPA minutes/day	600	0.091	0.03
Sedentary minutes/day	600	–0.048	0.31
Screen time, minutes/day	684	–0.044	0.45