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## 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  $14.6\pm 1.8$  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  $\text{min}^{-1} \text{day}^{-1}$ ) remained significantly associated with dog ownership ( $\beta=24.3$ ,  $\text{SE}=12.4$ ,  $p=0.05$ ) while the association with minutes of moderate-to-vigorous physical activity  $\text{day}^{-1}$  became nonsignificant ( $\beta=2.2$ ,  $\text{SE}=1.2$ ,  $p=0.07$ ). 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 problem<sup>1–3</sup> and may play a substantial role in the etiology of youth obesity and type II diabetes.<sup>4–6</sup> Recently, dog ownership has been positively associated with health-related factors among middle-aged and older adults, including physical activity,<sup>7–12</sup> weight,<sup>9</sup> and mental health.<sup>13–16</sup> However, there is little information about the associations between dog ownership and youth health behaviors and

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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.<sup>17–18</sup>

### 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).<sup>19–20</sup> ActiGraph data were reduced using the ActiProcess software<sup>21</sup> which employs imputation based on the Expectation Maximization algorithm. Summary physical activity variables were calculated using the Freedson age-specific count cutoffs<sup>22</sup> distinguishing moderate- and vigorous-intensity based on age-adjusted METs.<sup>23–24</sup> 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.<sup>25–27</sup>

**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  $\alpha = 0.77$ )<sup>28</sup> 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.<sup>11</sup> 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,<sup>29–31</sup> 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.

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**Table 1**Participant health-related physiologic and behavioral measures by dog ownership ( $n=618$ ); M (SD) or %

	<b>Full sample</b>	<b>0 dogs (47.4%)</b>	<b>1+ dogs (52.6%)</b>	<b>p-value</b>
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

	<i>n</i>	Spearman <i>r</i>	<i>p</i> -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