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1 **Dog ownership, dog walking and children's and parents' physical activity**

2

3 Running head: Dog ownership & physical activity

4

5

1 Abstract

2 This study aimed to determine cross-sectional associations between dog ownership, dog
3 walking and physical activity (PA) among children and their parents. Objective measures
4 of PA were obtained for children aged 5-6 and 10-12 years from 19 primary schools
5 across Melbourne, Australia. Parents self-reported their PA, dog ownership, and
6 frequency of dog walking. 53% of families owned a dog, 41% of children who owned a
7 dog did not walk their dog at all, and 32% reported never or rarely walking their dog as a
8 family. Dog ownership was associated with an additional 29 mins/day in PA among
9 younger girls, and 70 and 59 more minutes/week in PA among mothers of younger boys
10 and older girls, respectively. Among mothers of older girls, dog owners were 1.6 times as
11 likely to meet PA guidelines. Mothers with older boys and girls, and fathers with younger
12 boys, who reported walking the dog regularly as a family spent more time in PA (105, 90
13 and 158 more mins/week, respectively). The promotion of dog ownership and dog
14 walking among children and as a family are potential strategies for increasing
15 participation in PA among some families.

16

17 **Key words:** physical activity recommendations, walking, family

1 **Dog ownership, dog walking and children's and parents' physical activity**

2 Among adults, regular physical activity helps prevent obesity, cardiovascular
3 disease (CVD), hypertension, type 2 diabetes, some cancers, and premature mortality
4 (USDHHS, 1996). Among children, research has also shown some evidence of links
5 between physical inactivity and risk factors for CVD, overweight/obesity, type 2
6 diabetes, and positive associations between physical activity and psychosocial outcomes
7 and bone health (Biddle, Gorely, & Stensel, 2004). Physical inactivity has also been
8 associated with various indices of adiposity among children and youth (Lemura &
9 Maziekas, 2002). This is concerning because inactive children are likely to become
10 inactive adults (Kelder, Perry, Klepp, & Lytle, 1994), and physical activity tracks from
11 childhood to adolescence, and from adolescence to young adulthood (Troost & Pate,
12 1999).

13 Although promoting physical activity among adults and children is important for
14 population health, potential influences on physical activity must first be identified to
15 inform the development of effective strategies. Social influences have been identified as
16 important for children's and adults' physical activity (Sallis, Prochaska, & Taylor, 2000;
17 Trost, Owen, Bauman, Sallis, & Brown, 2002); however, the social environment has
18 usually been conceptualized in the form of peers, siblings or parents. Dog ownership may
19 also be an important social influence on physical activity among children and adults. For
20 example, children and/or their parents may walk their dog for companionship or may
21 engage in active play with their dog (e.g., running around with the dog or throwing a ball
22 or stick for their dog to fetch), which could contribute to overall physical activity levels.
23 Further, dogs may alleviate children's and/or their parents' concerns about neighborhood

1 safety by providing a sense of ‘protection’ from personal harm (Cutt, Giles-Corti,
2 Knuiman, & Burke, 2007). Finally, responsibility for their pet’s health and wellbeing
3 could be a motivating factor for walking or playing with a dog (Brown & Rhodes, 2006).

4 As a public health initiative, dog walking may provide an important contribution
5 to the likelihood of meeting adult physical activity recommendations (Bauman,
6 Schroeder, Fuber, & Dobson, 2001; Cutt, Giles-Corti, Knuiman, & Burke, 2007;
7 Schofield, Mummery & Steele, 2005). No studies, however, have examined whether dog
8 ownership or dog walking are associated with physical activity levels among children and
9 their parents. Therefore, this cross-sectional study aimed to examine the association of
10 dog ownership and dog walking with physical activity among children and their parents.

11

12

Methods

13 *Overview*

14 Data for the current study were obtained from the ‘Children’s Leisure Activities
15 Study’ (CLASS) conducted in 2001 (Telford, Salmon, Timperio, & Crawford, 2005),
16 which included objective measures of children’s physical activity and a questionnaire
17 completed by a parent/carer/guardian (referred to herein as ‘parent’). Ethics approval was
18 received from the Deakin University Human Research Ethics Committee and from the
19 Department of Education and Training, Victoria, Australia.

20

21 *Participants*

1 Participants in this study were students attending government primary
2 (elementary) schools in the eastern and western suburbs of Melbourne, Australia and their
3 parents. Melbourne is a sprawling urban city of approximately 4 million people across
4 9,000 square kilometers with a varied topography. Children in school grades Prep
5 (between 5-6 years of age) and 5 or 6 (between 10-12 years of age) and their parents were
6 recruited from 19 randomly selected schools from high and low socioeconomic status
7 (SES) areas based on the Socioeconomic Index for Areas (SEIFA) (Australian Bureau of
8 Statistics, 2001). Out of the 2,096 children who were given information about the study
9 and consent forms to take home to their parents inviting them to participate, 1,220 school
10 students (578 boys and 642 girls) and their parents returned consent forms to voluntarily
11 participate in this study (a response rate of 51% for schools in high SES areas and 36%
12 for schools in low SES areas). There were 294 children in the 5-6 year-old age group
13 (51% boys) and 926 children in the 10-12 year-old age group (46% boys). Of the 1,220
14 adults who completed the survey there were 1,001 mothers, 184 fathers, and the
15 remaining 35 respondents were grandparents, guardians or 'other'.

16

17 *Measures*

18 Children were asked to take home a questionnaire for their parent to complete.
19 The measures described below have been previously reported (Telford, Salmon, Jolley, &
20 Crawford, 2004; Timperio, Salmon, Chu, & Andrianopoulos, 2008) and have been shown
21 to have test-retest reliability ranging from 0.54 to 0.95 (Intra-Class Correlations for
22 continuous variables) and a kappa value of 0.98 for dog ownership.

23

1 *Sociodemographic characteristics*

2 Parents reported the child's sex, date of birth, and their relationship to the child in
3 the study. They also reported their own sex, age, employment status (paid or no paid
4 employment), marital status (single or dual parent family), language spoken at home
5 (English or other), and the levels of education (less than year 12; year 12/trade certificate;
6 university). For those in a dual parent family, respondents were asked to complete these
7 same items on behalf of their partner. Tertiles of area-level SES were computed based on
8 the 2001 SEIFA score of each participants' residential postcode (lowest, middle, highest).

9

10 *Dog ownership and dog walking*

11 Parents reported whether they own a dog (yes/no). The frequency that their child
12 walks a dog during a typical week (Monday to Friday) and weekend (Saturday and
13 Sunday) were summed to compute a total frequency of dog walking/week. These items
14 did not specify whether their child walked the dog alone or accompanied by others.

15 Parents also reported how frequently they walk a dog together as a family (i.e. at least
16 one adult walking the dog with the child) in a typical week. As few participants reported
17 walking the dog as a family 'once per week' or more, response options were
18 dichotomized as never/rarely (don't know/doesn't apply; never/rarely) and at least
19 once/month (1-2 times per month; once per week; several times per week; daily).

20

21 *Parents' physical activity*

22 Parents reported the frequency and duration (hours/minutes) they participate in
23 vigorous-intensity physical activity which makes them breathe harder or puff and pant

1 (e.g., tennis, jogging, cycling) in a usual week. They were also asked to report the
2 frequency and duration that they spend walking or doing other moderate-intensity
3 physical activities for at least 10 minutes continuously in a typical week (e.g., gardening,
4 walking the dog, golf, lap swimming). These physical activity questions were modified
5 from the Active Australia Survey and total duration of moderate- to vigorous-intensity
6 physical activity (MVPA) was calculated by summing the duration of moderate-intensity
7 and double the duration of vigorous-intensity physical activity (as per standard population
8 monitoring protocols) (Australian Institute of Health and Welfare, 2003). Mothers' and
9 fathers' MVPA were positively skewed and square-root transformations were therefore
10 performed. Untransformed values were used to dichotomize mothers' and fathers' MVPA
11 according to Australian adult physical activity guidelines (insufficiently active: <150
12 mins/week; sufficiently active: ≥ 150 min/week) (Department of Health and Ageing,
13 2004).

14

15 *Children's physical activity*

16 Parents reported the frequency that their child walked to school, walked the dog
17 and walked for exercise in a typical week (Monday to Friday) and weekend (Saturday
18 and Sunday). These variables were summed to compute total frequency of walking per
19 week. This variable was positively skewed and was therefore square-root transformed.
20 A uniaxial accelerometer¹ was used to objectively assess children's physical activity. The
21 accelerometer is designed to detect normal human movement in a non-controlled setting
22 without impeding activity. This device has been previously validated for monitoring
23 children's physical activity in the field (Janz, 1994; Janz, Witt & Mahoney, 1995).

1 Children wore the accelerometer on a nylon belt at their hip for eight consecutive
2 days. A complete day was defined as greater than 10,000 counts (equivalent to more than
3 10 hours of data) because it was unlikely that the accelerometer had been worn for the
4 majority of the day when the count was lower than this. Days in which total
5 accelerometer counts exceeded 20 million were also excluded from the analyses as this
6 indicated a possible malfunction of the accelerometer (Janz, Witt & Mahoney, 1995).
7 Movement counts recorded on day one and day eight for each child were excluded as
8 these typically did not represent full days. Most children in the sample (97%) had four or
9 more eligible days of data, and 92% had at least one weekend day. The mean time spent
10 in moderate- (3.0-5.9 metabolic equivalent units of rest [METs]) and vigorous-intensity
11 (6.0+ METs) physical activity was calculated using age-specific movement count
12 thresholds (Troost, Pate, et al., 2002). Minutes per day spent in MVPA were derived by
13 summing the time spent in each level of intensity on eligible days and dividing the total
14 by the number of days included. Children's MVPA mins/day data were positively
15 skewed; thus a square-root transformation was performed. As only 4% of the younger age
16 group and 15% of the older age group failed to meet the national physical activity
17 recommendations, MVPA was analyzed as a continuous variable.

18

19 *Statistical analysis*

20 Data were analyzed with Stata/SE (Version 10.0). As previous physical activity
21 studies have shown that the influence of mothers and fathers on young people's physical
22 activity can differ (Krahnstoever Davison & Schmalz, 2006), and consistent sex
23 differences in physical activity among adults (Troost, Owen, et al., 2002) and among

1 mothers and fathers (Bellows-Riecken & Rhodes, 2008) have been reported, mothers'
2 and fathers' physical activity was analyzed separately. As noted earlier, a small number
3 of grandparents and guardians responded to the survey; carers other than the child's
4 biological mother or father were assigned as 'mother' or 'father' based on their reported
5 sex for analysis purposes. Differences in children's physical activity by the child's age
6 and sex and differences in mothers' and fathers' physical activity by the age and sex of
7 their child were examined with independent t-tests (for transformed continuous outcome
8 variables) and Chi-square tests (for categorical data). Separate linear regression models
9 were used to examine associations between dog ownership and total walking
10 frequency/week (square root-transformed), and dog ownership and MVPA mins/day
11 (square root-transformed) among 5-6 and 10-12 year-old boys and girls. Neither parental
12 education level nor area-level SES were associated with children's MVPA, therefore
13 analyses did not adjust for these variables. Linear regression models were also used to
14 examine associations between dog ownership and self-reported MVPA mins/wk (square
15 root-transformed) among mothers and fathers. Bivariate linear regression models were
16 performed to examine associations between frequency of the child walking the dog each
17 week (continuous variable), frequency of walking the dog as a family each week
18 (rarely/never vs $\geq 1-2$ times/mth) and transformed children's MVPA mins/day among dog
19 owners. As the frequency of the child and the frequency of the family walking the dog
20 each week were significantly correlated ($r=.55$), a multivariable model was not
21 performed.

22 Among mothers and fathers who were dog owners, bivariate linear regression
23 models were performed to examine associations between frequency of walking the dog as

1 a family each week (rarely/never vs $\geq 1-2$ times/mth) and transformed MVPA mins/wk. In
2 addition, binary logistic regression analyses were performed to determine odds ratios
3 (95% confidence intervals) of mothers and fathers meeting physical activity
4 recommendations according to dog ownership (overall sample) and, according to dog
5 walking as a family (among dog owners). To test for potential confounding by SES as
6 indicated by a recent study with adults (Tudor-Locke & Ham, 2008), associations
7 between frequency of walking the dog as a family, frequency the child walked the dog
8 and area-level and individual-level (parental education) were assessed. There were no
9 significant differences for either variable by SES; therefore, no further adjustments to
10 analyses were performed. Statistical significance for all analyses was set at $p < .05$ and all
11 regression analyses were adjusted for clustering by school.

12

13

Results

14 *Socio-demographic characteristics*

15 The final sample with complete data available included 1,151 children, 1,152 mothers
16 and 957 fathers. The majority of respondents were women (84%), most reported speaking
17 English at home (94%), 82% were dual parent families, and the mean age was 39.8 ± 5.5
18 years. There was no significant difference in mean age of parents of 5-6 year olds
19 (37.0 ± 5.5 yrs) compared with parents of 10-12 year olds (40.7 ± 5.2 yrs). More than half
20 of the parents with younger children (54%) and over two-thirds of parents with older
21 children (70%) were in paid employment ($p < .001$). Maternal education levels were
22 evenly distributed across the sample, with 29% of mothers reporting less than 12 years
23 education, 37% completing 12 years, and 35% completing a university degree. Among

1 fathers, 25% had less than 12 years education, 42% had completed 12 years education,
2 and the remainder had a university degree. Approximately 53% of parents reported that
3 they owned a dog. A higher proportion of children aged 10-12 years (56%) owned a dog
4 compared with the younger children (44%); there were no differences by sex.

5

6 *Children's and parents' physical activity*

7 Table 1 shows children's and parents' participation in physical activity. On average,
8 children spent more than two-and-a-half hours per day in MVPA, and had more than five
9 walking sessions per week. Based on accelerometry data (average MVPA mins/day),
10 older boys were significantly more active than older girls, and younger boys and girls
11 were more active than older boys and girls respectively. In contrast, parents reported a
12 significantly higher frequency of total walking sessions per week among older boys and
13 girls compared with younger boys and girls, respectively. Among mothers and fathers,
14 more than three-quarters reported meeting current national physical activity
15 recommendations for adults (≥ 150 mins/week). Apart from mothers of older girls self-
16 reporting more MVPA mins/wk compared with mothers of younger girls, there were no
17 differences in parents' physical activity according to the age and sex of their child.

18

19 INSERT TABLE 1 ABOUT HERE

20

21 *Frequency of dog walking among dog owners*

22 Among dog owners, children walked their dog on average 1.7 (SD=2.1) times/week;
23 however, 41% of children who owned a dog did not walk the dog at all. Two-thirds
24 (68%) of families who owned a dog walked the dog as a family at least 1-2 times/month

1 and 32% reported never or rarely doing so. A higher proportion of younger boys (77%)
2 walked the dog as a family at least 1-2 times/month compared with older boys (64%,
3 $p < .05$).

4

5 *Physical activity and dog ownership*

6 Table 2 shows that dog ownership was positively associated with younger girls'
7 transformed MVPA mins/day. When back-transformed, this equated to an additional 29.3
8 (95% CI: 5.5, 53.1) mins/day MVPA compared with non-dog owners. Dog ownership
9 was significantly associated with children's frequency of total walking per week. On the
10 untransformed variable, this was equivalent to approximately 1.3 more walking sessions
11 per week among dog owners compared with non-owners. When stratified by age and sex,
12 this association was evident only among older girls, with those who owned a dog walking
13 more often (an additional 1.5 sessions/wk using untransformed data) compared with non-
14 dog owners.

15 Mothers with younger boys and older girls who owned a dog were significantly
16 more active than non-owners. On untransformed MVPA, this was equivalent to
17 approximately 70 and 59 minutes more MVPA per week among mothers of younger boys
18 and older girls, respectively. Overall, dog-ownership was not significantly associated
19 with the odds of mothers or fathers meeting physical activity recommendations.
20 However, among mothers of older girls, dog owners had 1.62 (95% CI=1.09, 2.42) higher
21 odds of meeting national physical activity guidelines compared with non-dog owners.

22

23

INSERT TABLE 2 ABOUT HERE

1

2 *Dog walking and physical activity among dog owners*

3 As shown in Table 3, among dog owners, mothers who reported walking the dog as a
4 family at least once/month spent more time in MVPA (untransformed 88 mins/wk)
5 compared with dog owners who did not walk the dog as a family. On stratification of the
6 sample by the child's age and sex, significant findings were only evident among mothers
7 with older boys and girls (untransformed 105 mins/wk and 90 mins/wk, respectively).
8 Among fathers who were dog owners with younger boys, those who reported walking the
9 dog as a family at least once/month spent more time in MVPA (untransformed 158
10 mins/wk) compared with dog owners who reported never or rarely walking the dog as a
11 family.

12 Mothers who walked their dog as a family at least once/month had higher odds
13 (OR=2.19; 95% CI=1.44, 3.32; $p<.001$) of meeting physical activity recommendations
14 than those who did not walk the dog as a family. This was particularly so for mothers of
15 older boys (OR= 1.88, 95% CI=1.29, 2.75; $p<.001$) and older girls (OR=2.85, 95%
16 CI=1.32, 6.15; $p<.01$). There were no such associations for fathers.

17

18

INSERT TABLE 3 ABOUT HERE

19

20

Discussion

21

22

23

This study investigated associations of dog ownership and dog walking with
physical activity among an Australian sample of children and their parents. Owning a
dog was associated with higher levels of physical activity among younger girls, mothers

1 with younger boys and mothers with older girls, and with higher frequency of walking
2 among older girls. Among dog owners, although dog walking was not associated with
3 physical activity among children, regular dog walking as a family was associated with
4 physical activity among mothers with older boys and girls, and fathers with younger
5 boys, and with meeting physical activity recommendations among mothers. Together, the
6 findings suggest that dog ownership and dog walking may be potentially fruitful
7 strategies for supporting physical activity among some families.

8 The findings among the mothers involved in this study are consistent with
9 previous research among adults that has shown that dog owners walk more than non-dog
10 owners (Bauman et al., 2001; Brown & Rhodes, 2006; Cutt, Giles-Corti, Knuiman,
11 Timperio, & Bull, 2008a; Schofield et al., 2005) and that dog owners who walk their dog
12 are more likely to meet physical activity recommendations compared with dog owners
13 who do not walk their dog (Coleman et al., 2008; Cutt, Giles-Corti, & Knuiman, 2008b;
14 Schofield, Mummery, & Steele, 2005; USDHHS, 1996). In this study, however, dog
15 ownership was only associated with additional physical activity among mothers, while
16 dog walking as a family was positively associated with physical activity among both
17 mothers and fathers and with meeting the physical activity guidelines among mothers.
18 Given that our measure did not specify which parent walked the dog with at least one of
19 their children (only that one parent walked the dog with the child); the limited findings
20 among fathers suggest that mothers may walk the dog with their child more frequently
21 than fathers. However, it should be noted that fewer fathers than mothers were included
22 in this study. These findings suggest that promoting family dog walking may be a
23 potential intervention strategy to increase physical activity among adults, possibly

1 because it provides social support for walking, both from other family members and the
2 family dog. Social support has been shown to be an important correlate of walking among
3 adults (Ball, Bauman, Leslie, & Owen, 2001). It is also possible that the social interaction
4 gained through walking the dog as a family may encourage mothers and fathers to walk
5 more frequently. Future studies should explore the feasibility of promoting dog walking
6 among families.

7 Although there is some existing research among adults, this is the first study to
8 examine the role of dog ownership and dog walking on physical activity among children.
9 While owning a dog was found to have physical activity benefits among girls, there were
10 no associations among boys. There are several potential reasons for the lack of
11 associations among boys. First, it is possible that boys may spend less time with their
12 dogs than girls. Second, the nature of boy's interactions with their dog may differ to that
13 of girls. For example, among younger girls, dog ownership but not dog walking was
14 associated with greater physical activity, suggesting that dog ownership may contribute to
15 physical activity of young girls mainly through active play. In addition, dog ownership
16 contributed to additional walking among older girls. Boys, in contrast, may engage in
17 activities with their dog that involve less physical activity for the child, such as playing
18 fetch.

19 Dog walking in general or as a family was not associated with physical activity
20 among either boys or girls. Children who owned dogs walked with them on average 1.7
21 times per week, however, this may not be sufficient to detect differences in overall
22 physical activity. Of note, 41% of children who owned a dog did not participate in any
23 dog walking. This is consistent with studies of adults that have also shown that not all

1 dog owners walk their dog regularly (Bauman, Schroeder, Furber, & Dobson, 2001; Cutt,
2 Giles-Corti, & Knuiman, 2008b; Ham & Epping, 2006), though there appears to be
3 significant variation in the frequency of dog walking among dog owners (Cutt, Giles-
4 Corti, Knuiman, & Burke, 2007). Future research should examine barriers to dog
5 walking specifically for children.

6 Among adults, recent research has found that owners who perceive that they have
7 good access to public open spaces with dog friendly features are more likely to walk with
8 their dog (Cutt, Giles-Corti, & Knuiman, 2008b), and that dog walkers are more likely to
9 live in high-walkable neighborhoods (Coleman et al., 2008). In addition, Cutt et al.
10 (2008b) found that dog owners who did not perceive that their dog provided motivation
11 or social support to walk more, were less likely to walk with their dog. In contrast, a
12 Canadian study found that dog owners who felt an ‘obligation’ to walk their dog were
13 more likely to do so than owners who did not feel such obligation (Brown & Rhodes,
14 2006). It is possible that barriers such as feeling no obligation to walk the dog or a lack of
15 social support for walking the dog may be overcome by walking the dog together as a
16 family. Although dog walking as a family was not associated with physical activity
17 among children in this study, this may be because our dichotomisation of this variable at
18 \geq once/month may have been too infrequent to detect associations. It has also been
19 suggested that individuals who are less attached to their dog or who own a smaller breed
20 may be less likely to take their dog for a walk (Schofield, Mummery, & Steele, 2005).

21 Although unique, the results of this study must be considered in the context of
22 several limitations. The cross-sectional design and the proxy-reports where the
23 respondent provided information about the behaviour of their child and partner are

1 limitations which may be prone to error. In addition, although this study included a large
2 sample of children of varying ages recruited from diverse geographic and socioeconomic
3 areas, the prevalence of dog ownership (53%) was higher than the national average of
4 about 40% of Australian households (Petcare Information and Advisory Service, 2002);
5 and there was a higher proportion of men and women meeting physical activity
6 recommendations compared with the estimated 60% of the general population meeting
7 recommendations in 2003 in the state of Victoria (Victorian Government Department of
8 Human Services, 2004) limiting the generalizability of the study findings. However, this
9 may simply reflect the fact that our sample comprises families with primary school-aged
10 children, rather than the general population. The number of years since the survey was
11 conducted (2001) is a further potential limitation. While there has been an increased
12 government focus on physical activity in Australia, the population prevalence among
13 adults and children shows little evidence of change in the last 8-9 years. The objective
14 measure of children's physical activity was a strength of this study.

15 In summary, the results from this study were mixed, but show that physical
16 activity benefits can be gained from dog ownership among mothers and younger and
17 older girls; and dog walking as a family can benefit physical activity levels of mothers
18 and fathers. Considering that a large proportion of households own a dog and that a
19 substantial proportion of dog owners do not walk their dog, the promotion of dog
20 ownership is potentially an important strategy for increasing physical activity among
21 some families. In order to maximize the potential health benefits associated with dog
22 ownership, it will be important for future studies to investigate barriers to dog walking

1 and strategies for overcoming these barriers and motivating dog owners to participate in
2 dog walking.

3

4

5

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1 Footnote

2 1. Actigraph model AM7164-2.2C, Manufacturing Technology Inc., Fort Walton Beach

3 FL, USA.

1 Table 1. Physical activity participation of children by age and sex, and mothers and
 2 fathers
 3

	Total sample	5-6 year old children		10-12 year old children	
		Boys (n=132)	Girls (n=131)	Boys (n=404)	Girls (n=484)
Children's physical activity	n=1151				
MVPA mins/day (mean, sd) ^a	158.5 (72.0)	275.7 (59.4) [†]	252.1 (57.0) [†]	142.7 (38.2) ^{† #}	117.1 (36.3) ^{† #}
Total walking freq/wk (mean, sd) ^b	5.3 (5.1)	3.8 (4.2) [†]	4.6 (4.9) [§]	5.5 (5.3) [†]	5.7 (5.0) [§]
Mothers' physical activity^c	n=1152				
MVPA mins/wk (mean, sd)	346.6 (302.6)	317.1 (286.7)	297.4 (219.3)**	372.9 (389.2)	362.3 (340.6)**
≥150 MVPA mins/wk (%)	78	79.5	76.9	78.0	77.2
Fathers' physical activity^c	n=957				
MVPA mins/wk (mean, sd)	355.7 (352.2)	282.8 (237.0)	364.4 (566.6)	370.8 (397.4)	414.8 (472.0)
≥150 MVPA mins/wk (%)	76	69.0	71.3	78.0	78.2

4 Age differences within sex: **p<.05; §p<.01; †p<.001; Sex differences within age: *p<.05; #p<.001

5 Independent t-tests performed on transformed continuous variables (data presented as raw means); Chi-
 6 squared tests performed on categorical variables

7 Note. MVPA= moderate- to vigorous-intensity physical activity; ≥150 MVPA mins/wk= meeting national
 8 physical activity guidelines

9 ^aaccelerometer data; ^bparental proxy-report; ^cparental self- and proxy-report

10

11

- 1 Table 2. Linear regression^a (B coefficient, 95% confidence intervals [CI]) examining
 2 associations between dog ownership and children's and parents' physical activity

	Total sample	5-6 year old children		10-12 year old children	
		Boys	Girls	Boys	Girls
	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)
Children					
MVPA ^{b, c}					
Dog ownership (no vs yes)	-0.04 (-0.45, 0.38)	0.19 (-.74, 1.14)	0.94 (0.15, 1.73)*	0.29 (-0.06, 0.62)	0.24 (-0.17, 0.66)
Total walking ^{b, d}					
Dog ownership (no vs yes)	0.36 (0.17, 0.56) [#]	0.30 (-0.09, 0.70)	0.34 (-0.25, 0.92)	0.28 (-0.03, 0.59)	0.38 (0.12, 0.64)**
Mother					
MVPA ^{b, e}					
Dog ownership (no vs yes)	1.18 (-0.14, 2.49)	2.56 (0.01, 5.1)*	2.11 (-0.51, 4.74)	-0.73 (-2.93, 1.47)	1.90 (0.16, 3.64)*
Father					
MVPA ^{b, e}					
Dog ownership (no vs yes)	0.88 (-0.48, 2.25)	1.72 (-2.24, 5.68)	-1.19 (-4.42, 2.04)	0.55 (-1.16, 2.27)	1.12 (-1.39, 3.63)

3 *p<.05, **p<.01, [#]p<.001;

4 Note. MVPA= moderate- to vigorous-intensity physical activity

5 ^aall analyses adjusted for clustering by school; ^bdependent variables square root transformed; ^caccelerometer data;

6 ^dparental proxy-report; ^eparental self- and proxy-report

7

8

- 1 Table 3 Linear regression^a (B coefficient, 95% confidence intervals [CI]) examining
 2 associations between child's dog walking, dog walking as a family and children's and
 3 parents' physical activity^b among dog owners

	Total sample	5-6 year old children		10-12 year old children	
	(n=593)	Boys (n=61)	Girls (n=56)	Boys (n=213)	Girls (n=267)
	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)
Children					
Walk the dog (freq/wk) ^c	-0.09 (-0.21, 0.04)	-0.08 (-0.45, 0.28)	0.05 (-0.14, 0.24)	-0.02 (-0.10, 0.06)	0.05 (-0.06, 0.16)
Walk the dog as a family (never/rarely vs ≥1-2 times/mth) ^c	0.43 (-0.08, 0.95)	0.64 (-0.73, 2.0)	0.60 (-0.56, 1.74)	0.23 (-.44, 0.91)	0.17 (-0.39, 0.73)
Mother					
Walk the dog as a family (never/rarely vs ≥1-2 times/mth) ^c	2.65 (1.31, 3.98) [#]	2.29 (-0.2, 4.78)	0.32 (-4.1, 4.75)	3.0 (0.86, 5.15)**	2.82 (0.72, 4.93)*
Father					
Walk the dog as a family (never/rarely vs ≥1-2 times/mth) ^c	1.19 (-1.5, 3.89)	5.89 (0.67, 11.07)*	2.68 (-2.81, 8.17)	3.32 (-0.2, 6.83)	-1.69 (-5.24, 1.86)

4 *p<.05, **p<.01, #p<.001

- 5 ^aall analyses adjusted for clustering by school; ^bOutcome variable MVPA log transformed, children's
 6 MVPA based on accelerometry data, parents' MVPA based on self- and proxy-report; ^cExplanatory
 7 variable in bivariate analyses