The association between dog ownership or dog walking and fitness or weight status in childhood

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WHAT IS ALREADY KNOW ABOUT THIS SUBJECT

- The health benefits of owning a pet dog have been researched in adults; dog owners are more active and people who walk their dogs have lower weight status.
- It is often postulated that children who grow up with pet dogs also benefit from them, but very little research has been done to evidence the effects of dog ownership specifically on child health.
- With high levels of obesity and childhood inactivity being a significant public health issue, it is important to examine whether a pet dog is an effective intervention to address this, as strategies to increase levels of dog walking are likely to be highly economical and sustainable.

WHAT THIS STUDY ADDS

- We examine over 1000 9-10yr old children and find no clear evidence of an impact of dog ownership or walking with a dog on weight status or fitness level.
- This is an important finding as it suggests that the activity that children currently do with dogs is not sufficient enough to impact weight status or fitness.

ABSTRACT

Health benefits of dog walking are established in adults: dog owners are on average more physically active and those walking their dogs regularly have lower weight status than those who do not. However, there has been little research on children. A survey of pet ownership and involvement in dog walking was combined with fitness and weight status measurements of 1021 9-10 yrs old children, in the Liverpool *Sports*Linx study. We found little evidence to support that children who live with, or walk with, dogs, are any fitter or less likely to be obese than those who do not. This is an important finding as it suggests that the activity that children currently do with dogs is not sufficient enough to impact weight status or fitness.

INTRODUCTION

Dog-owning adults are on average more physically active than non-owners [1] and there is some evidence that owners who walk their dogs are less likely to be obese than both owners who do not walk with their dogs, and non-dog owners [2]. A few studies show that children who own dogs are marginally more physically active [3-5], although others do not [6], but there has been little research into other health outcomes, especially regarding actual involvement in dog walking, as opposed to simply dog ownership [4, 6-8]. This study examined the association of dog ownership and involvement in dog walking, with childhood obesity and overweight. It also examined, for the first time, the association between dog ownership and involvement in dog walking, with fitness measures.

METHODS

Data collection has been described previously [9-14]. Briefly, over ten weekdays in October-November 2010, 1021 9-10 year old children, from 31 schools, were sampled during attendance at *Sports*Linx Fitness Fun Days in Wavertree, Liverpool, UK. Children completed the Child Lifestyle and Pets (CLAP) questionnaire as part of their rotation of activities. Participation in *Sports*Linx is subsequent to granted informed parental consent and participant assent, and after the completion of medical screening forms. Ethical approval for the addition of the Child Lifestyle and Pets (CLAP) questionnaire to a sample of the 2010-2011 *Sports*Linx data collection was obtained from the North West 3 Research Ethics Committee – Liverpool East.

Children were asked about the pets they currently owned and how often they: walked with any dog (theirs or someone else's); and walked with their own dog. Frequency was recorded as: never, once a week or less, several times a week or once a day or more. To ensure sufficient numbers for analyses, this was further collapsed into a two level variable of 'Once a week or less' versus 'Several times a week or more'. Parental consent forms collected information such as gender, age and home postcode (used to assign 2007 Index of Multiple Deprivation). Developmental age was estimated via years to peak height velocity using the equation developed by Mirwald [15]. Outcomes measured during EUROFIT fitness testing included 20-m multi-stage shuttle runs test (20m SRT), 10x5 Agility, Sit and Reach, Standing Broad Jump (SBJ) and Grip Strength [16]. Height and weight (Seca, Bodycare, Birmingham, UK), both measured by instructors, were used to calculate BMI. Age- and sex-specific cut-off points (International Obesity Task Force) [17] were used to classify participants in binary terms as being 'overweight or obese', or 'obese'.

Predictive variables tested were: lives with a dog; frequency of walks with any dog; and frequency of walks with own dog.. Univariable analysis was conducted using t-test or Kruskal-Wallis tests, followed by adjustment for confounders using regression modelling in MLwiN. For continuous measures, non-normally distributed data were transformed (log10). Multivariable two-level models were developed initially using a residual iterative generalised least-squares (RIGLS) algorithm, and then for binary outcomes, a second order penalised quasi-likelihood (PQL) [18]. The variables "school" and "child" were set as levels 2 and 1, respectively, to account for non-independence of the data (children clustered in schools). All models were adjusted for gender, developmental age, Index of Multiple Deprivation 2007. Analyses were also conducted stratified by gender in case there was evidence of effects in boys but not girls (or vice versa) but we did not find anything of interest (data not shown). Fitness outcome models were also adjusted for BMI Standard Deviation Score and weight

status models are presented both with and without additional adjustment for positive and negative food score intake [19]. Sample size calculations estimated that to detect a 50% reduction in risk of overweight (comparable to published interventions [20]) with expected 25% dog ownership [21] or 65% dog owning children walking with their dog several times a week or more [14], would require 600 and 100 participants respectively (95% confidence level, 80% power).

RESULTS

Table 1 shows evidence that dog ownership, but not dog walking, may be associated with lower flexibility (P=0.01) and explosive leg strength (SBJ: P=0.003). More frequent dog walking of own or any dog was weakly associated with greater grip strength (P=0.03-0.05).There was no evidence of an association between dog ownership or dog walking and obesity or overweight (Table 2). In Table 2; Model 2 we further adjusted for a measure of nutrition, using 'positive' (healthy) and 'negative' food intake by food types indicated [19]. Interestingly this reversed the direction of effect for dog walking variables to protective but remained insignificant.

DISCUSSION

These analyses offer asmall amount of evidence to support the premise that children who live with dogs are fitter, and no evidence that they are at less risk of obesity. The potential association between involvement in dog walking and improved grip strength is feasible considering that children of this age walking with a dog may at some points hold the leash. Our other tentative findings may be due to confounders associated with both dog ownership

and health. For an association between health outcomes and dog walking to be biologically plausible, we would expect to find a positive association between involvement in dog walking and child health rather than a negative association with ownership alone.We found no evidence of an association between dog ownership or dog walking and obesity or overweight. We may lack statistical power to detect a difference, however this is unlikely at least regarding weight given exceeding our sample size estimations. Furthermore, we did adjust for nutrition quality as well as social deprivation, as dog ownership is associated with socio-demographic factors related to poor health [13, 21]. Other studies have also found no association between dog ownership and child weight status [4, 6, 8], or a negative association only in some age groups [7]. Overall this suggests that the intensity of physical activity performed when walking a dog might not be vigorous or sustained enough to noticeably impact weight status . Further research is required into the intensity and contexts of physical activity during interactions between children and pet dogs.

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CW conceived and designed the study, collected the data survey, performed the data analysis and drafted the paper. LMB and GS provided access to data collection and advised on study design and data analysis. SD, PB, AJG, RMG, and KPC were involved in conception of the study, study design and interpretation of findings. AJG and KPC also assisted with data collection and SD was also principal investigator. SMcC assisted in study design and interpretation of findings. All authors read and approved the final manuscript. We are very grateful to the project partners: LJMU, Liverpool City Council in particular Liz Lamb Principal Health and Physical Activity Officer, Glen Groves Senior Fitness Officer, Liverpool PCT, and the schools, parents and children involved in the project. The funding source (WALTHAM® and Mars Petcare, divisions of Mars Inc) had input during study design, interpretation of results and writing of the manuscript but did not influence study findings.

CONFLICTS OF INTEREST

Prof. Dawson, Prof. Gaskell, Prof. Bundred, Dr. German, Dr Coyne and Dr Westgarth report grant funding from WALTHAM and MARS Petcare during conduct of the study. Dr German reports grants, personal fees, non-financial support and other from WALTHAM (owned by Mars Petcare), grants, personal fees, non-financial support and other from Royal Canin (owned by Mars Petcare), personal fees and other from Hills Petcare (owned by P&G), personal fees and other from Nestle-Purina, outside the submitted work. Dr Westgarth reports grants from Medical Research Council, outside the submitted work. Dr. McCune reports grants from Mars Petcare UK (sister company), during the conduct of the study; and WALTHAM who is the main sponsor of the study pays her salary. Prof Stratton and Dr Boddy have nothing to report.

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Table 1. Multi-level multivariable regression models of association between living with a dog, and walking a dog, with childhood fitness.

OUTCOME				**Crude***			**Adjusted**[$]		
Variable	**n**	**Median**	**P Kruskal Wallis**	**Coef**	**SE Coef**	**P**	**Coef**	**SE Coef**	**P**
20m SRT		**(runs)**							
Lives with a dog									
No	566	30.00	0.38						
Yes	333	29.00		-0.01	0.02	0.44	-0.01	0.02	0.75
Frequency walks with any dog									
Once a week or less	575	29.00	0.91						
Several times a week or more	238	32.00		-0.00	0.02	0.82	0.01	0.02	0.44
Frequency walks with own dog									
Once a week or less	101	28.00	0.42						
Several times a week or more	186	29.50		0.03	0.03	0.35	0.04	0.03	0.15
10x5 AGILITY		**(s)**							
Lives with a dog									
No	576	22.54	0.40						
Yes	333	22.59		0.00	0.00	0.50	0.00	0.00	0.50
Frequency walks with any dog									
Once a week or less	580	22.66	0.74						
Several times a week or more	241	22.48		0.00	0.00	0.50	-0.00	0.00	0.32
Frequency walks with own dog									
Once a week or less	101	22.64	0.93						

Several times a week or more	186	22.56			0.00	0.01	0.84	-0.00	0.01	0.69
					Crude			**Adjusted[$]**		
	n	**Mean**	**SD**	**P** T-test	**Coef**	**SE Coef**	**P**	**Coef**	**SE Coef**	**P**
SIT AND REACH (FLEXIBILITY)		**(cm)**								
Lives with a dog										
No	574	16.83	6.48	0.22						
Yes	337	16.32	5.94		-0.51	0.44	0.25	-1.26	0.49	**0.01**
Frequency walks with any dog										
Once a week or less	576	16.47	6.39	0.34						
Several times a week or more	246	16.91	5.92		0.37	0.48	0.44	0.28	0.53	0.60
Frequency walks with own dog										
Once a week or less	101	16.49	3.63	0.63						
Several times a week or more	189	16.12	5.85		-0.39	0.75	0.68	0.34	0.79	0.67
STANDING BROAD JUMP		**(m)**								
Lives with a dog										
No	584	1.24	0.21	**0.02**						
Yes	339	1.21	0.20		-0.03	0.01	**0.02**	-0.04	0.01	**0.003**
Frequency walks with any dog										
Once a week or less	590	1.24	0.21	0.52						
Several times a week or more	250	1.23	0.21		-0.01	0.02	0.50	-0.00	0.02	0.95
Frequency walks with own dog										
Once a week or less	100	1.20	0.20	0.73						

Several times a week or more	192	1.21	0.21		0.01	0.03	0.84	0.02	0.02	0.46
GRIP STRENGTH		**(kg)**								
Lives with a dog										
No	562	15.85	3.75	0.72						
Yes	337	15.76	3.26		-0.03	0.25	0.89	0.06	0.27	0.82
Frequency walks with any dog										
Once a week or less	574	15.60	3.57	0.29						
Several times a week or more	242	15.87	3.32		0.38	0.27	0.26	0.57	0.29	**0.05**
Frequency walks with own dog										
Once a week or less	101	15.05	3.16	**0.03**						
Several times a week or more	190	15.95	3.34		0.93	0.41	**0.02**	0.98	0.44	**0.03**

*Outcome is log10.
$Regression adjusted for gender, developmental age, Index of Multiple Deprivation 2007, BMI SDS.
Bold=P<0.05

Table 2. Multi-level multivariable regression models of association between living with a dog, and walking a dog, with childhood weight status. (International Obesity Task Force cut off for overweight or obese, and obese).

OUTCOME				**Crude**			**Model 1**			**Model 2 (+ nutrition)**		
Variable	**No, n (%)**	**Yes, n (%)**	**P Chi-squared**	**OR**	**95%CI**	**P**	**OR**	**95%CI**	**P**	**OR**	**95%CI**	**P**
OVERWEIGHT OR OBESE												
Lives with a dog												
No	367 (73.0)	136 (27.0)	0.90									
Yes	214 (73.0)	81 (27.0)		0.96	0.68-1.35	0.81	1.04	0.67-1.60	0.86	1.05	0.62-1.77	0.86
Frequency walks with any dog												
Once a week or less	373 (74.0)	131 (26.0)	0.93									
Several times a week or more	162 (74.3)	56 (25.7)		1.10	0.74-1.63	0.63	0.84	0.53-1.35	0.48	0.95	0.31-2.93	0.92
Frequency walks with own dog												
Once a week or less	64 (73.6)	23 (26.4)	0.53									
Several times a week or more	118 (69.8)	51 (30.2)		1.27	0.70-2.31	0.44	1.14	0.49-2.67	0.76	1.40	0.43-4.63	0.51
OBESE												
Lives with a dog												

	No	470 (93.4)	33 (6.6)	0.24								
	Yes	269 (91.2)	26 (8.8)		1.37	0.79-2.37	0.27	1.60	0.80-3.20	0.19	1.09	0.43-2.79	0.85
Frequency walks with any dog													
	Once a week or less	474 (94.1)	30 (5.9)	0.11								
	Several times a week or more	198 (90.8)	20 (9.2)		1.57	0.86-2.88	0.14	1.66	0.79-3.48	0.18	0.94	0.32-2.77	0.92
Frequency walks with own dog													
	Once a week or less	81 (93.1)	6 (6.9)	0.27								
	Several times a week or more	150 (88.8)	19 (11.2)		1.44	0.54-3.86	0.47	1.21	0.36-4.06	0.75	0.60	0.09-3.99	0.60

Model 1 - Logistic regression adjusted for gender, developmental age, Index of Multiple Deprivation 2007.
Model 2 - Logistic regression adjusted for gender, developmental age, Index of Multiple Deprivation 2007, positive foods score and negative foods score [19].
Bold=P<0.05