

Overweight in dogs, but not in cats, is related to overweight in their owners

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Abstract

Objective: To quantify the environmental component of aetiology of overweight and obesity by examining the relationship between the degree of overweight in dogs and cats and the degree of overweight in their owners.

Design: Cross-sectional study. Main outcome measures of the owners were weight, height (stature) and BMI. Of the animals, weight and divergence from ideal weight were measured by a veterinarian.

Setting: Three veterinary clinics in Amsterdam, The Netherlands.

Subjects: Dogs and cats, together with their owners, who visited the veterinary clinic. Dogs and cats had to be older than 1 year, and their owners had to be at least 21 years old. After exclusion, there remained forty-seven pairs of dogs and their owners and thirty-six pairs of cats and their owners.

Results: We found a significant relationship between the degree of overweight of dogs and the BMI of their owners ($r = 0.31$). Correction for length of ownership, gender and age of the animal, and gender, age, education level and activity score of the owner did not materially affect this relationship. However, after correction for the amount of time the dog was being walked each day, this relationship disappeared. No significant relationship was found between the degree of overweight of cats and the BMI of their owners.

Conclusions: The degree to which dogs are overweight is, in contrast to the degree to which cats are overweight, related to the BMI of their owners.

Keywords
Obesity
Overweight
Pets
Dogs
Cats
Owners

During the last two decades the prevalence of overweight and obesity has increased dramatically in fast industrializing countries. Even in the USA and UK it has more than doubled^(1,2). This trend is worrying, because overweight and obesity contribute to the aetiology of many serious illnesses like type 2 diabetes mellitus, hyperlipidaemia, hypertension, CVD, many types of cancer, gallbladder diseases and several musculoskeletal diseases^(1,3).

To stop this 'epidemic' it is important to know more about the pathogenesis of overweight and obesity, and more specifically the contribution of interacting genetic and environmental factors^(4,5). Genetic factors are principally irreversible and have been reported to explain 50–90% of the variance in BMI⁽⁴⁾. However, for the prevention and treatment of overweight and obesity, potentially reversible environmental factors are of greater interest. As the human gene pool cannot have changed drastically in past decades, it is likely that the increasing

prevalence of overweight and obesity is due to changes in environmental factors^(2,6). Probably individual attitudes and behaviour, like food intake and physical activity, which change in reaction to secular trends, play an important role⁽⁶⁾. In the last few decades Western society has changed into one in which people have more sedentary lifestyles and high-fat, energy-dense diets. These environmental factors are generally accepted to contribute to positive energy balance and hence to weight gain^(1,3,5). However, the exact impact of the environmental component on body weight has not been quantified very well.

As pets and their owners have no genetic relationship, and pets are, with regard to their food and lifestyle, dependent on their owners' attitudes and behaviour, the relationship between the weight of owners and their pets provides information about the effect of individual attitudes and behaviour on body weight. Indeed, in 1970, Mason had already demonstrated a relationship between obesity in pet dogs and the degree of obesity in their owners⁽⁷⁾. More recently this finding was confirmed by

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Colliard *et al.*⁽⁸⁾ and Kienzle *et al.*⁽⁹⁾. In the present study we aimed to quantify the environmental component in the aetiology of overweight and obesity by examining the relationship between cats and dogs, on the one hand, and their owners on the other. A correlation in overweight between pets and their owners would represent the impact of environment on body weight changes and hence give a quantitative indication of the environmental component of the aetiology of overweight.

Methods

Participants

Data were collected in three veterinary clinics in different districts in Amsterdam with different socio-economic characteristics.

Inclusion criteria

Individuals who visited the veterinarian with their dog or cat were asked to cooperate in the study, in the case that they were the actual owner. The individuals needed to be at least 21 years of age, to ensure they were fully grown and would be able to decide about their own lifestyles and how they take care of their pets. The dogs and cats needed to be older than 1 year and to belong to the owner for at least 1 year. Of the 135 people who were asked to cooperate, fourteen refused because of a lack of time, because they were tired or because of serious illness of the dog or cat, which concerned them. Of the 121 pairs of owners and their pets that were willing to cooperate, thirteen did not fulfil the age criteria.

Exclusion criteria

The state of health of the owners and the pets was judged by one investigator and several veterinarians, respectively, in which the following categories were distinguished: (i) healthy; (ii) no effect on the weight; (iii) a possible effect on the weight; and (iv) an almost certain effect on body weight. Owners, as well as their pets, were excluded in cases where the health state of one of them had a possible or almost certain effect on body weight. The total number of pairs of owners and their pets screened was 108, of which fifty-seven comprised a cat and its owner, and fifty-one comprised a dog and its owner. Seven pet owners were excluded because of health-related weight changes, of which two were because of weight-influencing medication, one because of thyroid gland dysfunction, one because of pregnancy, one because of renal failure, one because of malignancy and one because of Crohn's disease. Eighteen pets were excluded for weight-influencing states of health, of which six had active infection, three refused to eat or vomited, three had thyroid gland dysfunction, two had renal diseases, two had declared weight loss and two had diabetes. After exclusion there remained thirty-six cat-owner

pairs and forty-seven dog-owner pairs. The owners of pets were approached at random (in order of presentation in the waiting room of the veterinary clinic). Clinics were open only during working hours. There is no indication for any selection bias introduced by time of day.

Outcome measures

Individuals were asked to fill out a questionnaire containing questions about characteristics such as age and gender of the owner and pet, duration of ownership, level of education and activity score of the owner. Physical activity level of the owner was assessed by the Short Questionnaire to Assess Health-enhancing Physical Activity (SQUASH)⁽¹⁰⁾. With respect to the time spent walking the dog, we asked for the average usual time on a typical day in minutes per day. We asked about the body weight at the time the owner acquired the pet and we calculated the difference between this and the current body weight. There was a question about the highest level of achieved education. Education was divided into three levels of education: (i) low level, education at the lowest level of secondary school (in Dutch: VMBO); (ii) average level, education at the mean (in Dutch: HAVO) or highest level (in Dutch: VWO) of secondary school or the lowest level of professional education (in Dutch: MBO); and (iii) high level, education at a level of at least higher professional education (in Dutch: HBO) or university. Body weight and height were measured and BMI was calculated as $[\text{body weight (kg)}]/[\text{height (m)}]^2$, because it has a strong correlation to the total amount of body fat⁽¹¹⁾.

The weight of the animals was measured by the veterinarian during the consultation. Because of a lack of comparable indices for pets, the veterinarian made a visual estimation of the ideal body weight of the pet, using the amount of fat visible and palpable on the ribs, vertebrae and pelvic bones. To make it possible to compare the weight of the pets, the degree of overweight (percentage) of the pet was calculated with the formula: $\{[\text{measured weight (kg)}]/[\text{estimated ideal weight (kg)}]-1\} \times 100\%$.

Statistical analysis

Data were analysed using the SPSS for Windows statistical software package version 11.5 (SPSS Inc., Chicago, IL, USA). A *P* value <0.05 was determined as indicating significance. The Pearson correlation coefficient (*r*) was used to study the correlation between the degree of overweight of the owner and that of the dog or cat. Partial correlations between the degree of overweight of the owner and that of the dog or cat were computed after correction for relevant parameters. Parameters were tested for a normal distribution using the Kolmogorov-Smirnov test. The study sample was too small to allow for meaningful statistical interaction between independent variables and the overweight status of the pets.

Results

The description of the study population is shown in Table 1. A minority of pets as well as their owners were male. Body weight and BMI of dog owners and pet owners were comparable. The weight of the dog owners was stable since the acquisition of the pet, in contrast to the weight of the cat owners, which increased by 2.5 kg.

The duration of ownership correlated with borderline significance with the degree of overweight of the dog ($r=0.24$, $P=0.10$). No significant correlation was found between the degree of overweight and the age of the dog ($r=0.21$, $P=0.15$). Between time spent walking the dog and the degrees of overweight of the owner and the dog, non-significant correlations were found ($r=0.22$, $P=0.14$ and $r=0.07$, $P=0.64$, respectively). The activity score of owners was also not related to their own degree of overweight ($r=-0.01$, $P=0.96$).

The relationship between the degree of overweight of pets and the BMI of their owners is presented in Table 2 for dogs and in Table 3 for cats. The degree of overweight of dogs and the BMI of their owners were correlated positively with each other, which was not the case for cats and their owners. The correlation between the degree of overweight of dogs and the BMI of their owners was weakened after correction for gender of the owner and disappeared after correction for the time spent walking

the dog. The influence of the different veterinarians was studied by using regression, and none of the veterinarians had a significant influence on the correlation between the BMI of the dog owners and the degree of overweight of the dogs.

Discussion

We have demonstrated a positive relationship between the degree of overweight of dogs and the BMI of their owners that disappeared after correction for time spent walking the dog. For cats and their owners we have not found such a correlation.

Table 2 Relationship between the degree of overweight of dogs and the BMI of their owners, Amsterdam, The Netherlands

Model	<i>r</i>	<i>P</i> value
1 Degree of overweight of dog v. BMI of owner	+0.31	0.03
2 Model 1 + duration of ownership	+0.31	0.04
3 Model 2 + gender of dog	+0.30	0.04
4 Model 2 + gender of owner	+0.25	0.09
5 Model 2 + age of owner	+0.32	0.04
6 Model 2 + age of dog	+0.30	0.04
7 Model 2 + education level of owner	+0.36	0.03
8 Model 2 + activity score of owner	+0.32	0.04
9 Model 2 + time spent walking the dog	+0.17	0.27

Bivariate (Pearson) correlations and partial correlations between the degree of overweight of dogs and the BMI of their owners.

Table 1 Characteristics of individuals and their pets (dogs or cats), Amsterdam, The Netherlands

	Dog-owner pairs (<i>n</i> 47)		Cat-owner pairs (<i>n</i> 36)	
	Mean or <i>n</i>	SD or %	Mean or <i>n</i>	SD or %
Kind of ownership (<i>n</i>)				
Single ownership	20	42	17	47
Together with someone	21	45	18	50
Help now and then	6	13	1	3
Gender of pet is male (<i>n</i>)	20	43	10	28
Age of pet (years)	6.9	3.9	7.7	4.1
Duration of ownership (years)	6.5	4.1	6.5	4.0
Reason for acquisition (<i>n</i>)				
For company	39	82	30	83
Physical exercise	4	9	0	0
Other reason	4	9	6	17
Body weight of pet (kg)	19.4	12.8	4.9	1.3
Overweight of pet (%)	4.8	8.6	12.3	18.4
Gender of owner is male (<i>n</i>)	17	36	10	28
Age of owner (years)	44.5	12.5	43.4	13.0
Level of education (<i>n</i>)*				
Low	8	16	1	3
Average	24	51	10	28
High	15	33	25	69
Time spent walking with pet (min/d)	90	48	0	0
Activity score SQUASH (0–7)†	5.6	2.4	5.5	2.3
Weight of owner (kg)	72.4	17.6	69.6	14.6
Weight change of owner since acquisition of pet (kg)	−0.2	3.2	2.5	5.3
Height of owner (m)	1.73	0.09	1.71	0.09
BMI of owner (kg/m ²)	23.9	3.9	23.8	4.4

Variables are presented as mean and standard deviation or as number (*n*) and percentage.

*In The Netherlands the educational system can be divided in three levels of education: (i) low level, education at the lowest level of secondary school (in Dutch: VMBO); (ii) average level, education at the mean (in Dutch: HAVO) or highest level (in Dutch: VWO) of secondary school or the lowest level of professional education (in Dutch: MBO); and (iii) high level, education at a level of at least higher professional education (in Dutch: HBO) or university.

†SQUASH: Short Questionnaire to Assess Health-enhancing Physical Activity⁽¹⁰⁾.

Table 3 Relationship between the degree of overweight of cats and the BMI of their owners, Amsterdam, The Netherlands

Model	<i>r</i>	<i>P</i> value
1 Degree of overweight of cat v. BMI of owner	-0.11	0.53
2 Model 1 + duration of ownership	-0.11	0.54
3 Model 2 + gender of cat	-0.08	0.65
4 Model 2 + gender of owner	-0.12	0.50
5 Model 2 + age of owner	-0.09	0.62
6 Model 2 + age of cat	-0.10	0.56
7 Model 2 + education level of owner	-0.03	0.89
8 Model 2 + activity score of owner	-0.09	0.61

Bivariate (Pearson) correlations and partial correlations between the degree of overweight of cats and the BMI of their owners.

The positive relationship between the weight of dogs and their owners has been described previously by Mason⁽⁷⁾, Colliard *et al.*⁽⁸⁾ and Kienzle *et al.*⁽⁹⁾. It indicates that owners might apply their personal attitudes and behaviour to their pets⁽¹²⁾, which is supported by our finding that the degree of overweight of dogs is positively related to the duration of ownership. None of the mentioned studies examined the exact quantitative correlation.

Colliard *et al.* have described that increasing age of dogs is a risk factor for obesity⁽⁸⁾. However, in our transverse study, we could not demonstrate a significant correlation between age of dogs and degree of overweight, suggesting that the effect of the age of the pet dog is less important than the duration of exposure to a particular lifestyle.

The finding that the correlation between the degree of overweight of dogs and the BMI of their owners disappeared after correction for time spent walking the dog suggests that the shared spent energy of the dog-owner pair determines the degree of overweight of dogs as well as their owners. However, we were not able to demonstrate a significant correlation between the time spent walking the dog and the degree of overweight of the dog and owner.

That we did not find a correlation between the degree of overweight of cats and the BMI of their owners can be explained by outside activity. Cats that are allowed to go outside separately are less dependent on their owner with respect to their physical activity and food intake. Several studies have demonstrated that cats being allowed to go outside are less often overweight than cats staying inside^(13,14).

Our findings may contribute to the development of advice or interventions for the management of obesity and the prevention of overweight in man. A major advantage of the advice to get a dog and walk it regularly over other interventions by increasing physical activity is that it leads to exercise at least three times a day, every day of the week and all year round. Many exercise programmes to prevent overweight seem to fail because of the lack of urgency to comply with the exercise regimen and owning a dog may be one way to increase compliance.

There are a few weaknesses in the present study. The questionnaires were filled out by the participants (pet owners) themselves, who are conscious that an active lifestyle is healthier and desirable. An effect of this could be that the participants overestimated their physical activity and the time spent walking their dogs, which may have caused underestimation of the correlation between physical activity or time spent walking the dog and the degrees of overweight of dogs and their owners.

Another weakness of the questionnaire is that there was no question about other cats or dogs living in the same household, because their presence might influence the amount of food and physical activity the pet gets. Also, there should have been a question about whether cats are allowed outdoors or not, to find out the degree of dependence of the cat on the owner concerning food and physical activity. The determination of weight and overweight in the pets was done by different veterinarians. It would have been more consistent if one veterinarian had done all of them, to reduce the amount of subjectivity. However, after correction for the veterinarian, the correlation between the overweight of dogs and their owners' BMI was still present and none of the veterinarians had a significant influence on the found correlation between the BMI of the owners and the degree of overweight of the dogs. Concerning the veterinarians, another weakness was their awareness of the aim of the study. Seeing the body contours of the pet owners during the consultation might have biased estimations of the body weights of pets. One possibility to reduce potential bias would have been to have the measure of overweight in dogs and cats rated independently by more than one veterinarian. This was not possible for practical reasons. We have no indication that there was any differential misclassification of overweight in pets by the participating veterinarians. With respect to the dogs and the cats, it would be more consistent to compare only dogs and cats of one breed, because energy needs might differ by breed. Conducting the study only among dogs and cats that visited the veterinary clinic might have biased the outcomes, because it is possible that the owners who cooperated are more concerned about the health of their pets than the average dog or cat owner. Finally, a bigger study population would have given better results concerning the correlations in the subgroups especially since only two dogs were considered obese. Cutt *et al.*⁽¹⁵⁾ have reviewed the association between dog ownership and adult physical activity levels, but they concluded that there is limited evidence on the physical environment and policy-related factors that affect dog owners walking their dog. They recommend further studies on dog ownership and human physical activity levels.

In conclusion, our findings confirm that the weight of dog owners is correlated to the weight of their pet dogs. This correlation gives a quantitative indication of the impact of environmental factors such as personal attitudes

and behaviour concerning food and physical activity. Getting a dog with the instruction to walk it regularly might be an effective way to prevent overweight in both the owner and the dog. Trials may be needed to firmly assess the dose relationship between length and frequency of walking and overweight status in owners and dogs.

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References

1. Dutch Health Council (2003) *Overweight and Obesity. Nr. 2003/07*. The Hague: Health Council.
2. Flegal KM, Carroll MD, Ogden CL & Johnson CL (2002) Prevalence and trends in obesity among US adults, 1999–2000. *JAMA* **288**, 1723–1727.
3. World Health Organization (2000) *Obesity: Preventing and Managing the Global Epidemic. WHO Technical Report Series* no. 894. Geneva: WHO.
4. Maes HHM, Neale MC & Eaves LJ (1997) Genetic and environmental factors in relative body weight and human adiposity. *Behav Genet* **27**, 325–351.
5. Hill JO & Melanson EL (1999) Overview of the determinants of overweight and obesity: current evidence and research issues. *Med Sci Sports Exerc* **31**, 11 Suppl., S515–S521.
6. Hewitt JK (1997) The genetics of obesity: what have genetic studies told us about the environment? *Behav Genet* **27**, 353–358.
7. Mason E (1970) Obesity in pet dogs. *Vet Rec* **23**, 612–616.
8. Colliard L, Ancel J, Benet J-J, Paragon B-M & Blanchard G (2006) Risk factors for obesity in dogs in France. *J Nutr* **136**, 7 Suppl., 1951S–1954S.
9. Kienzle E, Bergler R & Mandernach A (1998) A comparison of the feeding behavior and the human–animal relationship in owners of normal and obese dogs. *J Nutr* **128**, 12 Suppl., 2779S–2782S.
10. Wendel-Vos GC, Schuit AJ, Saris WH & Kromhout D (2003) Reproducibility and relative validity of the short questionnaire to assess health-enhancing physical activity. *J Clin Epidemiol* **56**, 1163–1169.
11. Kok P, Seidell JC & Meinders AE (2004) The value and limits of the ‘body mass index’ (BMI) for determining the health risk of overweight and obesity. *Ned Tijdschr Geneeskde* **148**, 2379–2382.
12. Roy MM & Christenfeld NJS (2004) Do dogs resemble their owners? *Psychol Sci* **15**, 361–363.
13. Scarlett JM, Donoghue S, Saidla J & Wills J (1994) Overweight cats: prevalence and risk factors. *Int J Obes Relat Metab Disord* **18**, Suppl. 1, S22–S28.
14. Robertson ID (1999) The influence of diet and other factors in owner-perceived obesity in privately owned cats from metropolitan Perth, Western Australia. *Prev Vet Med* **40**, 75–85.
15. Cutt H, Gilles-Corti B, Knuijman M & Burke V (2007) Dog ownership, health and physical activity: a critical review of the literature. *Health Place* **13**, 261–272.