



## Prevalence and risk factors for feline obesity in a first opinion practice in Glasgow, Scotland

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A cross-sectional questionnaire study of cat owners registered with a first opinion veterinary practice was undertaken in July 2008. The body condition score (BCS) of the cats was assessed by the interviewer using a validated five point scale. Owners also rated their cat's BCS using five word descriptions. In total, 118 questionnaires were collected. The prevalence of overweight or obese cats (BCS 4 or 5) was 39% (30.2–47.8%,  $n = 61$ ). Risk factors associated with overweight or obesity were frequency of feeding and neutered status. There was moderate agreement between owner and interviewer rating of BCS. Owner misperception was more likely when owners rated cats with BCS 1 (very thin) and 4 (overweight) and in longhaired cats. The study highlights the continuing need for owner education in feline nutrition and specifically the requirement for veterinarians to develop strategies to help owners correct their assessment of their cat's BCS.

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Obesity in companion animals is generally accepted to exist when an animal is 20% or greater than its ideal body weight, whereas overweight animals are considered to be between 10% and 19% greater than optimal body weight.<sup>1</sup> Both are the result of a prolonged positive energy balance.<sup>1</sup> Prevalence estimates for overweight or obesity in cats are between 18% and 52%.<sup>2</sup> The most recent estimate for the UK found 48% of 168 cats were overweight and 4% were obese, based on a modified nine point scale.<sup>2</sup>

The high prevalence of feline obesity is multi-factorial with risk factors identified by others including apartment dwelling, inactivity, middle age, being male, neutering age and being neutered, being of mixed breeding, feeding of treats and ad libitum feeding and being in multi-cat households.<sup>2–4</sup>

Obesity in cats has been linked to a multitude of diseases including hepatic lipidosis,<sup>5</sup> feline urinary tract disease<sup>6</sup> and dermatological conditions.<sup>7</sup> Obese cats were found to be 3.9 times more likely to develop diabetes, 4.9 times more likely to develop lameness and 2.3 times more likely to have non-allergic skin conditions, compared with cats of optimal body condition.<sup>7</sup> Therefore, trying to understand the risk factors associated with cats becoming overweight or

obese is important not only for obesity prevention, but also for obesity treatment.

Previous studies have shown associations between owner underestimation and cat obesity<sup>8</sup> and moderate agreement between owners and vets when rating cat body condition score (BCS).<sup>9</sup> Increased owner awareness of normal feline body shape may be the first step in promoting weight management and may be key to the long-term success of weight loss programmes.<sup>10</sup>

The aims of this study were to describe the prevalence and risk factors for overweight or obesity in cats, assess the ability of owners to rate their cat's body shape and to determine whether any risk factors were associated with owner misperception of their cat's body shape in a cat population from a first opinion practice in Glasgow.

### Materials and methods

The questionnaire survey took place in a first opinion charity practice in Glasgow during a 3-week period in July 2008. Owners of cats over 1 year old were asked to complete a short questionnaire which included questions about signalment, feeding and lifestyle (see Table 1). One questionnaire was completed per household and only closed questions were included in the questionnaire.

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**Table 1.** Multinomial regression result of misperception types by interviewer assessment of cat BCS.

Body condition score	Underestimation	RRR (95%CI)	P value	Correct estimation	Overestimation	RRR (95%CI)	P value
	N			N	N		
1	0	NA	0.927	11	8	15.27 (1.69–138.27)	0.015
2	1	0.14 (0.02–1.18)	0.07	14	5	7.5 (0.79–71.23)	0.079
3	11	*	*	21	1	*	*
4	20	2.73 (1–7.41)	0.049	14	0	NA	0.936
5	8	3.82 (0.94–15.55)	0.615	4	0	NA	NA

\* = Reference level, RRR = relative risk ratio.

A veterinary student trained in the procedure (RO'H) assessed the BCS of cats using a five point body condition scoring system both visually and by palpation over ribs and abdomen as previously described by LaFlamme.<sup>11</sup> Animals with a BCS of 1 were classed as very thin, 2 as thin, 3 as ideal, 4 as overweight and those with a BCS of 5 as obese. The objectives and methods were explained to the participating practice and the study was approved by the University of Glasgow Ethics and Welfare Committee. Owners, without being given any guidance, were asked to assign their cat to one of the following word descriptions: far too thin, a bit thin, just right, a bit overweight or very overweight.

All statistical analyses were carried out in R version 2.9.2 2009 (R Foundation for Statistical Computing). Statistical significance was defined at  $P < 0.05$ . Prevalence estimates were calculated with binomial exact 95% CIs. One-way analysis of variance (one-way ANOVA) test was used to compare the cat age means between BCS categories. The assumption of homogeneity of variances was checked using Bartlett's test. Tukey's honestly significant difference (HSD) test was used as the test of multiple comparisons following the one-way ANOVA. Fisher's exact test was used to investigate whether there was an association between frequency of feeding and whether cats were fed an exclusively dry diet.

Possible risk factors for being overweight or obese (BCS 4 and 5) were evaluated using binary logistic regression. BCS was collapsed into to groups; BCS 2–3 – not overweight and BCS 4–5 – overweight. Cats with a BCS of 1 were excluded from this analysis as they may have had concomitant disease that would have unduly influenced the results.<sup>8,9</sup> Potential risk factors were selected on the basis that they had previously been identified as risk factors for feline obesity. Age was introduced into the model both as a continuous and a categorical variable based on the AAFCP–AAHA: Feline Life Stage Guidelines.<sup>12</sup> All variables significant at  $P < 0.25$  were entered into the multivariable analysis.<sup>13</sup> Forward and backward selections were used to build the final multivariable

model. Interactions and confounding between variables were assessed. Residuals were plotted from each model to detect any outlying or influential observations. Hosmer–Lemeshow goodness of fit test was used to assess how well the final model fitted the data. The final model was rerun excluding any outlying or influential observations and the coefficients were evaluated for any significant change. The predictive ability of the model was determined by using a receiver operating curve (ROC). A model with an area under the ROC of greater than 0.7 was considered to have acceptable discriminatory power.<sup>14</sup>

Weighted and unweighted kappa statistics were calculated to assess the degree of agreement between interviewer and owner BCS rating. The kappa statistics was interpreted as: <0.2 slight agreement, 0.2–0.4 fair agreement, 0.4–0.6 moderate agreement, 0.6–0.8 substantial agreement, >0.8 almost perfect agreement.<sup>15</sup> The interviewer rating was taken as the gold standard for cat BCS. Misperception was categorised into three groups; correct estimation (no difference between interviewer and owner rating of BCS), underestimation (owner rated the cat as a lower BCS than the interviewer) and overestimation (owner rated the cat as a higher BCS than the interviewer). Possible risk factors for owner misperception of BCS were assessed using multinomial logistic regression analysis. Possible risk factors assessed were cat age, life stage of cat, neutered status, sex, whether the cat was a cross breed, and whether the cat was long-haired. Correct estimation was the reference category. BCS was forced into the model to account for variation due to BCS. Each variable was individually assessed in the model. Forward and backward stepwise logistic regression analysis was then used to build the multivariable model. All variables significant at  $P < 0.25$  in the univariable analysis were included in the stepwise selection.<sup>13</sup> Interactions between explanatory variables were not assessed in this model because of the complexity of interpreting the results. For the final model diagnostics, two binary logistic regression models were created from the final multivariable model (correct estimation/

overestimation and correct estimation/underestimation). The residuals were plotted from these models to detect any outlying or influential observations.

## Results

A total of 118 questionnaires were available for analysis.

### Prevalence of overweight or obese cats

Figure 1 shows the assessment of cat BCS by the interviewer. In total, 28.8% ( $n = 34$ ) of cats were rated as overweight (BCS 4) and 10.2% ( $n = 12$ ) of cats rated as obese (BCS 5). Twenty-eight percent ( $n = 33$ ) of cats were rated as ideal (BCS 3). The overall prevalence for overweight or obese cats was 39% [95% confidence interval (CI) 30.2–47.8]. The mean age of cats varied significantly across BCS categories ( $P < 0.001$ ). Cats with a BCS of 1 were significantly older than cats in BCS 3, 4 and 5.

### Prevalence of cat body shape misperception in cat owners

Sixty-four cat owners (54.2%) were able to identify their cat's BCS correctly, 11.9% ( $n = 14$ ) of owners overestimated their cat's BCS while 33.9% of owners ( $n = 40$ ) underestimated their cat's BCS. The agreement between owner and vet assessment of BCS showed moderate to high agreement [unweighted  $\kappa = 0.405$  (0.289–0.522), weighted  $\kappa = 0.779$  (0.584–0.973)].

Figure 1 shows the distribution of owner misperception of cats in each BCS category. Owners of cats

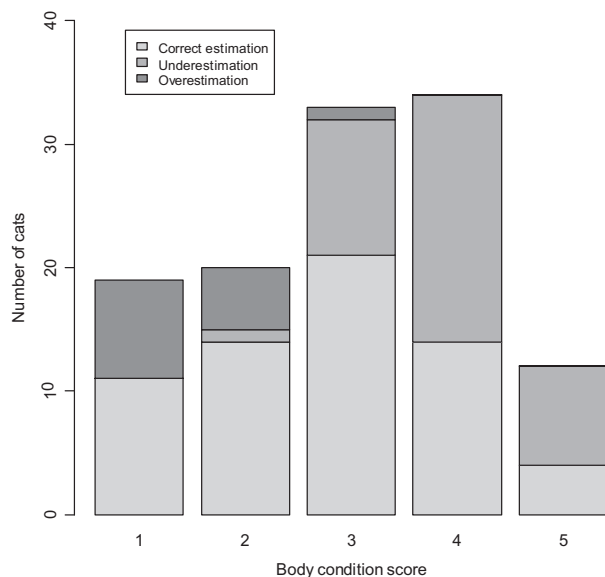


Fig 1. Interviewer assessment of cat body condition score on a five point scale where animals with a BCS of 1 were classed as underweight, 2 as slightly underweight, 3 as ideal, 4 as overweight and those with a BCS of 5 as obese. Bars are divided in owner misperception types (underestimation, overestimation and correct estimation).

with BCS 1 were 15.3 (95%CI 1.69–138.27) times more likely to overestimate than correctly estimate their cat's BCS (Table 1). Conversely, owners of cats with BCS 4 were 2.7 (95%CI 1–7.41) times more likely to underestimate their cat's BCS. The majority of owners (92.6%  $n = 50$ ) who incorrectly identified their cat's BCS were incorrect by one BCS category.

### Demographics

The mean age of the population was 9.08 ( $\pm 5.42$ ) years. Using the AAFF–AAHA Feline Life Stage Guidelines,<sup>12</sup> 21 cats (17.8%) were classed as being in the junior life stage (1–2 years), 20 cats (16.9%) were in the prime life stage (3–6 years), 30 cats (25.4%) were in the mature life stage (7–10 years), 25 cats (21.2%) were in the senior life stage (11–14 years) and 22 cats (18.6%) were in the geriatric life stage (15 years plus).

Of the cats taking part, 46.6% ( $n = 55$ ) were male neutered, 44.1% ( $n = 52$ ) were female neutered, 5.9% ( $n = 7$ ) were female entire and 3.4% ( $n = 4$ ) were male entire.

The majority of cats were reported as cross breeds (91.5%,  $n = 108$ ). The remaining 10 cats comprised of seven different breeds: Devon Rex ( $n = 2$ ), Persian ( $n = 2$ ), British Shorthair ( $n = 1$ ), Burmese ( $n = 1$ ), Havana ( $n = 1$ ), Maine Coon ( $n = 1$ ), Manx ( $n = 1$ ) and Ragdoll ( $n = 1$ ). Of all cats taking part, 90.7% ( $n = 107$ ) were classed as shorthaired and 9.3% ( $n = 11$ ) of cats were longhaired. Fifty-five (46.6%) of cats had access outdoors while 53.4% of cats ( $n = 63$ ) were kept indoors.

### Diet

A majority of cats were fed some amount of wet food (91.5%,  $n = 108$ ). Over half of the cats were fed ad libitum (53.4%,  $n = 63$ ), whereas 18.6% ( $n = 22$ ) of cats were fed three times a day, 27.1% ( $n = 32$ ) were fed twice a day and one cat was fed once a day. There was no difference in the frequency of feeding between cats who were fed on an exclusively dry diet and those fed on wet food (Fisher's exact test  $P = 0.49$ ). In total, 44.9% of owners never gave snacks or treats to their cats ( $n = 53$ ), 12.7% ( $n = 15$ ) of owners gave snacks/treats a few times a month, 23.7% ( $n = 28$ ) gave snacks and treats a few times a week and 18.6% ( $n = 22$ ) gave snacks/treats daily; 24.6% ( $n = 29$ ) of owners never gave table scraps to their cats, 16.1% ( $n = 19$ ) of owners gave scraps a few times a month, 41.5% ( $n = 49$ ) gave scraps a few times a week and 17.8% ( $n = 21$ ) gave scraps daily.

### Owner feeding habits and knowledge about obesity

Owners were asked how they decided how much to feed their cat. The majority (69.5%,  $n = 82$ ) fed until their cat stopped eating, 16.1% ( $n = 19$ ) used the instructions on the pet food, 7.6% ( $n = 9$ ) said it was

the amount they always fed their cat, 4.2% ( $n = 5$ ) asked their vet, one owner assessed their cat's body shape and adjusted the amount accordingly and 1.7% ( $n = 2$ ) said they didn't know. Fifty-three (44.9%) of owners were aware of the health risks of obesity.

### Obesity risk factor analysis

After excluding 19 cats with a BCS of 1, 99 cats were entered into this analysis. A BCS of 2 or 3 was obtained for 53.5% ( $n = 53$ ) cats while 46.5% ( $n = 46$ ) were BCS 4 or 5. Table 2 shows the results of the

**Table 2.** Obesity univariable risk factor results.

Variable	Level	BCS 2–3	BCS 4–5	Odds ratio (95%CI)	P value
Sex	Male	27	23	*	
	Female	26	23	1.038 (0.474–2.288)	0.925
Age (years)	Mean (SD)	8.792 (±4.40)	7.261 (±5.41)	0.94 (0.86–1.02)	0.130
Life stage	Junior	9	11	*	
	Prime	11	9	0.669 (0.193–2.327)	0.528
	Mature	14	14	0.818 (0.259–2.590)	0.773
	Senior	10	9	0.736 (0.209–2.595)	0.634
	Geriatric	9	3	0.273 (0.056–1.319)	0.106
Neutered status	Entire	27	23	*	
	Neutered	26	23	4.50 (0.920–22.020)	0.063
Indoors/outdoors	Indoor only	26	20	*	
	Has access to outdoors	27	26	1.252 (0.566–2.768)	0.579
How do you decide how much to feed?	Instructions on the can or packet	10	9	*	
	Advice from the vet	0	4	NA	0.582
	Feed until cat stops eating	40	27	0.442 (0.269–2.089)	0.997
	Assess body condition and adjust	1	0	NA	0.997
	Always fed my cat this way I don't know	1	6	6.667 (0.668–66.533)	0.106
Dry diet	Exclusively dry diet	4	6	*	
	Some wet food	49	40	0.544 (0.146–2.063)	0.371
Frequency of feeding	Once a day	0	1	NA	0.991
	Twice a day	10	18	3.938 (1.488–10.422)	0.006
	Three times a day	8	11	3.008 (1.015–8.910)	0.047
	Ad libitum	35	16	*	
Awareness of health risks of obesity in cats	Yes	22	20	*	
	No	31	26	0.923 (0.415–2.051)	0.843
Frequency of feeding snacks/treats	Every day	10	11	*	
	Few times a week	14	9	0.592 (0.149–2.263)	
	Few times a month	4	8	1.786 (0.34–10.779)	
	Never	25	18	0.659 (0.201–2.125)	0.393
Frequency of feeding table scraps	Every day	11	7	1.489 (0.473–4.683)	0.496
	Few times a week	19	18	0.449 (0.104–1.934)	0.283
	Few times a month	14	4	2.968 (0.854–10.312)	0.087
	Never	9	17	*	
Cross breed	Cross	47	42	*	
	Pure	6	4	0.746 (0.197–2.826)	0.666
Longhaired	Longhaired	5	4	*	
	Shorthaired	48	42	1.094 (0.276–4.341)	0.899

\* = Reference level.

univariable analysis. One risk factor was significantly associated with being overweight or obese: cats that were fed twice a day were four times more likely to be overweight or obese than cats fed ad libitum ( $P=0.006$ ). Neutered status was also strongly associated with being overweight or obese ( $P=0.063$ ).

Five variables significant at  $P<0.25$  in the univariable analysis were entered into the multivariable analysis. The final model contained two variables (Table 3). Neutered status was strongly associated with obesity. Also owners who reported feeding their cats twice or three times a day were more likely to have overweight or obese cats than those owners who fed ad libitum. The area under the ROC (0.686) indicated the multivariable model approached acceptable accuracy when predicting cats as being either overweight or not overweight.<sup>14</sup>

### Owner misperception risk factor analysis

All 118 cats were entered into the analysis. The results of the analysis are shown in Table 4. Owners with longhaired cats were 11.5 times more likely to underestimate their cat's BCS than owners of shorthaired cats ( $P=0.04$ ). No multivariable model was built as only one variable was significant at  $P<0.25$ .

## Discussion

Over a third (39%) of cats in our study were overweight or obese on a five point scale.<sup>11</sup> Over half (54.2%) of the cat owners surveyed were able to describe their cat's body shape accurately. To the authors' knowledge, this represents the first feline obesity prevalence estimate in Scotland and the first in the UK in a population of vet-visiting cats. There was moderate to high agreement between owner and vet assessment of BCS and this is similar to another study that also found moderate agreement ( $\kappa=0.46$ ).<sup>9</sup> Owner underestimation of feline body shape was most common in overweight cats. This has also been found in a previous study.<sup>8</sup>

The high prevalence of feline obesity is likely to be multi-factorial. Our study found that neutering and feeding frequency were risk factors. Risk factors

identified by others have included neutering age, feeding of treats and ad libitum feeding and multi-cat households.<sup>2</sup>

The results of both the prevalence and risk factor analyses need to be interpreted with caution as the study population may not necessarily be representative of the general population throughout the UK. Interpretation of obesity risk factor analysis and the misperception risk factor analysis also needs to take into account that this study was under-powered and the degree of fit of the final model. As with any questionnaire survey, there was also likely to be reporting bias<sup>15</sup> which needs to be taken into account when explaining the results. Our prevalence estimate is smaller than the most recent study in UK which estimated the overweight or obese prevalence to be 48%.<sup>2</sup> This is surprising given that this owner population was likely to have lower incomes than average and this has been linked to higher rates of canine obesity.<sup>16,17</sup> Possible associations between owner income and feline obesity warrant further investigation. The previous study in UK was based on a cat population recruited via house-to-house interviews while our study population were vet-visiting cats. Therefore, our study was more likely to include cats with concurrent disease that may be more likely to have lower BCS. Data surrounding the reasons for the individual cats presentations at the veterinary practice were not gathered so we were unable to verify this and this presents a major limitation to our study. Other limitations in the study design include the short data collection period and lack of data on the repeatability of the BCS scoring. The effect of the short data collection period is difficult to evaluate. Although no studies have been published to show seasonal variations in feline BCS, this cannot be discounted as a potential bias. An assessment of the repeatability of the BCS scoring was also not carried out. Previous studies where clear and standardised BCS guidelines have been used (similar to this study) have given repeatability estimates of around 0.5.<sup>18</sup>

Several other studies have found that neutered cats were at increased risk of being overweight or obese.<sup>9,19</sup> Neutering has been proposed to lead to increased food intake and lowering of resting metabolic

**Table 3.** Obesity multivariable risk factor model.

Variable	Level	Coefficient/SE	Odds ratio (95%CI)	P value
Neutered	Entire	*	*	
	Neutered	-2.23/0.857	4.867 (0.935–25.33)	0.009
Frequency of feeding	Ad libitum	*	*	
	Once a day	16.217/1455.398	NA	0.991
	Twice a day	1.420/0.511	4.413 (1.519–11.266)	0.005
	Three times a day	1.131/0.568	3.100 (1.018–9.437)	0.046

\* = Reference level, SE = standard error.

**Table 4.** Owner misperception univariable risk factor results.

Variable	Levels	Underestimation		RRR (95%CI)	P value	Correct estimation		Overestimation		RRR (95%CI)	P value
		N	Coeff/SE			N	N	Coeff/SE			
Age			0.05/0.051	1.05 (0.95–1.16)	0.317			–0.02/0.068	0.98 (0.86–1.12)	0.804	
Life stage	Junior	9	*	*		11	1	*	*		
	Prime	4	–0.66/0.712	0.51 (0.13–2.08)	0.351	14	6	–12.89/724.285	NA	0.982	
	Mature	13	0.18/0.644	1.2 (0.34–4.23)	0.78	12	5	2.34/1.592	10.33 (0.46–234.16)	0.142	
	Senior	6	0.28/0.746	1.32 (0.31–5.69)	0.709	15	0	–1.01/1.466	0.36 (0.02–6.44)	0.491	
	Geriatric	8	0.92/1.015	2.5 (0.34–18.31)	0.366	12	2	–0.03/1.346	0.97 (0.07–13.57)	0.982	
Sex	Male	18	*	*		34	7	*	*		
	Female	22	0.44/0.461	1.55 (0.63–3.82)	0.344	30	7	–0.06/0.656	0.94 (0.26–3.42)	0.931	
Neutered	Entire	5	*	*		5	1	*	*		
	Neutered	35	–0.96/0.78	0.38 (0.08–1.76)	0.22	59	13	–0.26/1.26	0.77 (0.07–9.09)	0.835	
Cross	Cross breed	34	*	*		60	14	*	*		
	Pure breed	6	0.78/0.733	2.18 (0.52–9.17)	0.289	4	0	–6.82/73.527	NA	0.926	
Longhaired	Longhaired	34	*	*		61	12	*	*		
	Shorthaired	6	2.44/1.193	11.53 (1.11–119.45)	0.04	3	2	0.56/1.023	1.75 (0.24–13)	0.585	
Indoor/outdoor	Indoor only	16	*	*		30	9	*	*		
	Has access to outdoors	24	0.34/0.462	1.4 (0.57–3.46)	0.468	34	5	–0.87/0.686	0.42 (0.11–1.61)	0.205	

\* = Reference level, Coef = coefficient, SE = standard error, RRR = relative risk ratio.

rate in neutered animals,<sup>20</sup> while it has also been suggested neutering may lead to decreased physical activity.<sup>3</sup> These results emphasise again the importance of communicating the risks of neutering and its association with obesity to owners.

The frequency of feeding emerged as a risk factor in our final model. Owners who reported feeding twice or three times a day were more likely to have overweight or obese cats than owners who fed ad libitum. Other studies have found no difference in the risk of overweight and obesity between feeding frequencies,<sup>4,8,21</sup> while Russell et al.<sup>2</sup> found that cats fed ad libitum were more at risk of obesity. Clearly, there is a lack of consensus on the effect of feeding in feline obesity. The differences in findings between studies could be attributed in part to questionnaire wording. Owner education on suitable methods of how to determine the right quantity to feed their cat and clearer instructions on pet food labels have been recommended as potential obesity preventative measures.<sup>21,22</sup> Our findings reinforce the importance of owner awareness and use of feeding guidelines as preventative measures for obesity. These findings and inconsistencies between previous study findings in this area demonstrate the need for further investigation into optimum feeding strategies for cats.

Several studies have identified activity level as a predictor of obesity.<sup>3,4</sup> Access to outdoors can be used as a proxy for activity levels.<sup>2</sup> We found no difference in the risk of obesity between cats that had outdoor access and those that did not. Age or life stage was not found to be risk factors for overweight or obesity in contrast to others.<sup>2</sup> We cannot exclude that this was due to insufficient statistical power in the study.

Owners appeared to normalise their perception of their cat's BCS. Owners of cats of BCS 1 overestimate their cats BCS and owners of cats with BCS 4 underestimate their cats BCS. No significant increase in the likelihood of underestimation was detected in cats with BCS 5. This may be due to insufficient power to detect an effect due to the relatively small number of cats with BCS 5.

Only one factor emerged in the risk factor analysis for misperception. Owners of longhaired cats were more likely to underestimate their cat's body shape than owners of shorthaired cats. Long hair is likely to disguise adipose deposits to a greater degree than short hair. Owner body condition scoring systems as part of owner education packages based both on visual cues and palpation may therefore be more effective than visual assessment alone.

The lack of other identified risk factors for misperception may reflect that the problem may be more a product of unmeasured owner factors such as demographic factors and socio-economic status as seen in studies of human body shape misperception.<sup>23</sup> Also current negative attitudes to obesity in humans and animals may lead to reluctance in owners to use certain descriptive terms for their cat's body shape

such as 'very overweight'. Therefore, an owner's choice of descriptive term may be an interaction between their true perception and their willingness to use certain descriptive terms.<sup>23</sup>

Human studies have shown that misperception prevalence is dynamic and affected by the social environment, eg, media reports, public health campaigns and the overall prevalence of obesity.<sup>23</sup> It would be interesting to investigate temporal changes in owner's ability to assess whether their pet is overweight. This would be especially helpful when evaluating the impact of owner educational campaigns to reduce companion animal obesity. A decline in sensitivity or recognition of overweight has important implications for health messages as those owners of animals marginally overweight are unlikely to see messages as being personally relevant.<sup>23</sup>

In conclusion, our findings demonstrate that the prevalence of obesity in cats was high within a population of cats visiting a veterinary practice. The risk factors identified were broadly in agreement with others including studies in Australia, France and United States possibly indicating that the factors influencing the development of feline obesity may be similar throughout these countries. Further research needs to be undertaken to establish optimum feeding frequency in cats. Given the high rate of owner misperception of feline body shape, veterinarians should develop strategies to help these owners correct their assessment of their cat's BCS particularly in long-haired cats using visual cues and palpation. Although the causes of feline obesity are likely to be multi-factorial, owner education on feline nutrition may be a key element in feline obesity prevention and treatment.

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