



FROM PROBLEM TO SUCCESS

Feline weight loss programs that work

Kathryn Michel and Margie Scherk



Consumption of kcal > energy expenditure = weight gain

By far the most common nutritional condition that is recognized in pet cats is the problem of excessive weight gain. There have not been any recent large scale investigations of the prevalence of this condition; however, an investigation from the mid-1990s found that nearly 29% of 8159 cats over 1 year old and living throughout the United States were classified as overweight, with a body condition score (BCS) of 4/5, and another 6.4% were judged grossly obese (BCS = 5/5).¹ There is no reason to think that the situation has improved in the past 15 years, nor is this problem limited to the US, as a more recent investigation in France

attests.² The investigators in that study evaluated 385 healthy cats seen at a veterinary school vaccination clinic and found that 27% had a BCS of 4/5 or 5/5. These figures are concerning, but they do not reveal the entire picture. When the US data was analyzed to look at the proportion of cats with a BCS of $\geq 4/5$ by age, the percentage of overweight/obese cats aged 5–12 years rose to between 40 and 50%.³

A generally agreed upon definition of obesity is a body weight 20% or more above ideal, with individuals weighing 10–20% over ideal considered overweight.⁴ Weight maintenance is a matter of energy balance – weight gain will occur when a cat consumes calories in excess of its energy expenditure. Such a scenario can happen all too easily given the pampered lifestyle of many domesticated cats. For example, a 4 kg cat consuming a mere 10 kcal/day in excess of its daily energy needs (the equivalent of about 10 kibbles of a typical dry cat food) will gain nearly 0.5 kg of adipose tissue (the energy content of adipose is estimated as 7920 kcal/kg) or 12% of its body weight over the course of just 1 year.

So, given that excessive weight gain can happen readily, appears to be a common phenomenon among pet cats, and, regrettably, has a negative impact on health, how do practitioners address this serious condition?

Practical relevance: Obesity is the most common unhealthy nutritional condition that is recognized in cats. Documented associated health risks include diabetes mellitus, lameness, non-allergic skin disease, feline lower urinary tract disease and idiopathic hepatic lipidosis.

Clinical challenges: Simply recommending a diet designed for weight loss fails, in most cases, to result in successful weight loss in the obese or overweight cat. A more in-depth approach that centers on communication and commitment, alongside a program of feeding a predetermined amount of a specific diet plus exercise and enrichment of the cat's life, offers a chance for a healthy result.

Patient group: It has been reported in some developed countries that as much as 40–50% of the feline population may be overweight or obese, with middle-aged cats, male cats, mixed-breed cats and neutered cats being at greatest risk.

Audience: This review of what is currently known about the health risks, predisposing factors and treatment of excessive weight gain in cats is aimed at all veterinary health professionals.

Evidence base: The information reported in the review is drawn from the current scientific literature as well as from the clinical experience of the authors.



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Kathryn E Michel
DVM MS DACVN
University of Pennsylvania
School of Veterinary Medicine, USA
Email: michel@vet.upenn.edu

Margie A Scherk
DVM DABVP (feline practice)
cats!NK, Vancouver, Canada
Email: hypurr@aol.com



Health risks of excessive weight gain

While the hazards of obesity have not been as extensively studied in cats as in some other species, there is evidence that overweight cats are at increased risk of a number of pathologic conditions. Retrospective studies have found excessive body weight to be a risk factor for feline lower urinary tract disease and idiopathic hepatic lipidosis.^{5,6} In an epidemiologic study of nearly 1500 cats living in the north-eastern United States, an association was found between overweight or obese BCS and diabetes mellitus, lameness and non-allergic skin disease.⁷

In recent years, the focus has shifted to elucidating what role excessive adiposity plays in the pathogenesis of these conditions. Increasingly, we are recognizing that white adipose tissue (WAT) is not simply an energy depot but rather a metabolically active secretory organ.⁸ Furthermore, progression from a lean to an obese state leads to alterations in the morphology and secretions of WAT that may underlie the pathogenesis of some of the conditions associated with obesity.

It has been recognized for several decades that, with weight gain, cats develop glucose intolerance and impaired insulin secretion.^{9,10} Those findings, coupled with the epidemiologic evidence that obese cats have a nearly four-fold greater risk of becoming diabetic compared with normal-weight cats,⁷ have led investigators to take a closer look at the metabolism of WAT in lean and obese cats.

The peptides and hormones secreted by WAT are collectively known as adipokines and include leptin, adiponectin and various



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cytokines, in particular tumor necrosis factor alpha (TNF- α). Findings in companion animals are preliminary to date; however, investigations have found that overweight cats have increased circulating levels of leptin and TNF- α and decreased circulating levels of adiponectin.¹¹⁻¹³ Leptin and TNF- α have been shown to decrease insulin sensitivity in many tissues while adiponectin improves insulin sensitivity.¹⁴ Hence, the alterations in circulating levels of these adipokines that occur with weight gain could, in part, be mediating the changes in glucose tolerance that are observed clinically in overweight cats. Hopefully, further investigations along these lines will help to elucidate the role of obesity in the pathogenesis of feline diabetes mellitus and other associated diseases.

Increasing awareness of overweight and obesity

Fundamental to combatting the problem of excessive weight gain in the feline population is for veterinary professionals to take this issue seriously. In one investigation of computerized medical records data from 52 veterinary practices located throughout the US, 28.7% of feline patients were classified as being overweight by BCS, yet only 1.4% were reported as being overweight by diagnostic code.¹ While this investigation was not able to document whether any concerns about the patients' body condition were expressed to their owners, it does suggest that, at least in some instances, veterinarians are neglecting to address the health implications of excess weight and obesity in their feline patients. So while most veterinarians and veterinary technicians recognize

Each excess 0.5 kg on a cat is equal to approximately 6.8 kg on the average 5'4" adult woman and 7.7 kg on the average 5'9" adult man.



Figure 1 Obese cat weighing 8.6 kg (ideal weight 4.5 kg). Courtesy of the Association for Pet Obesity Prevention

Cat's weight (kg)	Percentage overweight	Equivalent weight for a 5'4" adult woman (kg)	Equivalent kg overweight for adult woman	Equivalent weight for a 5'9" adult man (kg)	Equivalent kg overweight for adult man
4.5	0%	65.8	0	76.7	0
4.9	10%	72.6	6.8	84.4	7.7
5.9	30%	85.7	20.0	99.8	23.1
6.8	50%	98.9	33.1	115.2	38.6
9.0	100%	131.5	65.8	153.3	76.7
9.5	110%	138.3	72.6	161.0	84.4
10.4	130%	151.5	85.7	176.4	99.8
11.3	150%	164.7	98.9	191.9	115.2

Adapted from the Association for Pet Obesity Prevention

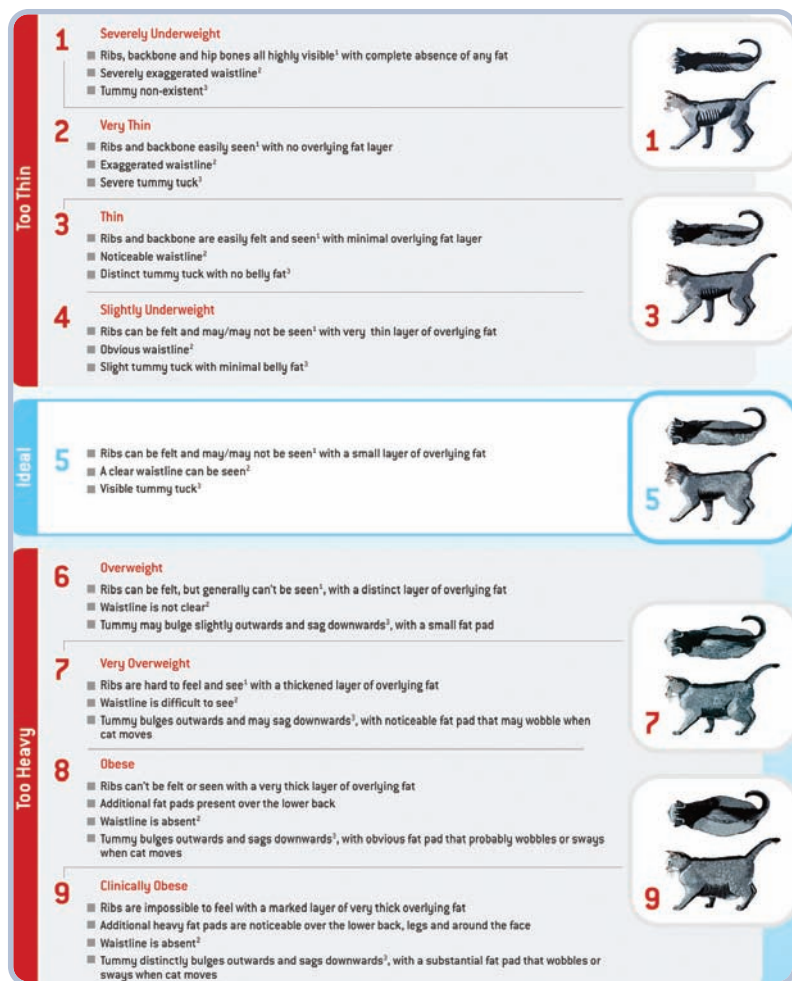


Figure 2 Nine-point body condition scoring system validated for use in cats. Courtesy of Dorothy Laflamme/Nestlé Purina

that conditions of overweight and obesity are not merely aesthetic issues for their patients, it is likely that we can do more to impress the benefits of maintaining cats in optimal body condition upon their owners.

The first step is to teach people how to assess their cat’s body condition. Once a cat owner learns how to recognize what is, and is not, optimal, they can be taught how to adjust their feeding practices to address undesirable weight gain or loss. Teaching the cat owner what constitutes an optimal body condition for their pet is a step that absolutely cannot be overlooked. Two investigations examined the ability of cat owners to assess their pet’s body condition and found significant differences between the assessments of a trained observer and the cat owners.^{2,15} In both studies, owners of overweight or obese cats underestimated their cats’ BCS in comparison with the expert’s findings. Again in both studies, the investigators, using multiple logistic regression, found owners’ underestimation of their cats’ body condition to be a risk factor for

being overweight, with similar odds ratios (19.12 vs 20.7).^{2,15} Therefore, simply demonstrating a body condition scoring technique to a cat owner without giving clear criteria for what constitutes optimal body condition will not be sufficient training to ensure proper feeding practices going forward, especially if the patient is already overweight.

Targeting optimal weight

Compared with dogs, the range of variation in optimal adult body weight of cats is minimal. The difference between being considered ideal or obese could be as little as 0.9 kg of excess weight for a typical domestic shorthair that ideally should weigh around 4.5 kg (Figure 1 and Table 1). Most people do not have access to an accurate scale, and so using routine monitoring of a cat’s body weight as a basis for making adjustments to its diet would not be practical. Body condition scoring, by contrast, requires no special equipment, is easy to learn and so can be used to assess and modify feeding practices in the home setting.

A number of different body condition scoring systems have been proposed for companion animals including a system with a five-point scale that was referred to earlier. Figure 2 shows a nine-point system that has been validated for use with cats, both in terms of reproducibility between trained observers and body composition using dual energy x-ray absorptiometry (DEXA).¹⁶ The system uses a combination of evaluation of body silhouette and palpation for assessment of adiposity. The owner should be instructed to palpate for the abdominal fat pad in the cat’s inguinal region in addition to palpating for body fat over the cranial rib cage. Some cats may have a large abdominal fat pad and yet only a minimal fat covering over their ribs. Any palpable fat pad denotes an excess of body fat, regardless of the amount of fat covering over the rib cage.¹⁶ For cats, a BCS of 5/9 is considered optimal. Based on DEXA, this score reflects 25–30% body fat; each increment in BCS above or below approximates to an increase or decrease of 10–15% in body weight.¹⁶ (It is important to realize that this guide fails at 9/9, as patients that are morbidly obese can far exceed this scale.)

At each clinic visit every patient should have its BCS assessed and recorded, along with an accurately obtained body weight. Weight change can easily be calculated and thus can help to detect trends before they become dramatic.

Instruct the owner to palpate for the abdominal fat pad in the cat’s inguinal region in addition to palpating for body fat over the cranial rib cage.



$$\% \text{ Weight change} = \frac{(\text{Current weight} - \text{Previous weight})}{\text{Previous weight}} \times 100$$

Risk factors for weight gain

The factors that put cats at risk of excessive weight gain fall into three categories: those with respect to the patient's caregiver, those with respect to the patient itself, and those with respect to the patient's environment.

The caregiver

A major factor related to the caregiver, as discussed earlier, has to do with inability to accurately assess a pet's body condition. Undoubtedly, the nature of the human–animal bond is such that the relationship between cat and owner plays a role as well. Researchers in Germany interviewed cat owners and found that, among other things, individuals owning overweight cats had a closer relationship with their cats and were more likely to view their cats as a substitute for human companionship than owners of normal-weight cats.¹⁷ More work needs to be done in this area; however, taking the time to solicit the client's point of view with regard to starting the pet on a weight reduction program may help you craft a more successful plan for that patient. While the subject of communication is beyond the scope of this review, there are some excellent resources for helping practitioners enhance their communication skills;¹⁸ clearly, developing a rapport and eliciting the client's understanding and concerns about a proposed plan of action can only be beneficial.

The patient

The patient factors that have been found through multivariate analysis to be associated with overweight or obese body condition include age, gender, breed and whether the cat is intact or neutered.^{1,2,19} In general, middle-aged cats, male cats, mixed-breed cats and cats that are neutered are at greater risk of being overweight or obese.

The last risk factor, neutering, has been extensively studied and investigators consistently report both an increased food intake as well as decreased caloric requirement for weight maintenance shortly after spaying or castration.^{20–24} In other words,

if a client has not been educated as to how to make adjustments in feeding management based on body condition assessment before their pet is gonadectomized, and not warned to be prepared for changes in feeding behavior and calorie requirement post-neutering, the patient will be at significant risk of inappropriate weight gain. An opportune time to review both the client's feeding management and proficiency in body condition scoring, and to advise them of what to expect, is when the patient is examined for a spay or castration. Ideally, a recheck weigh-in within a month postoperatively would serve to ensure that appropriate monitoring and adjustment of feeding is taking place. This intervention should be relatively simple to implement in practice and could have a major impact on feline health.

The environment

Some environment-related factors that might contribute to weight gain in pet cats include those that influence physical activity (eg, indoor confinement and lack of environmental stimulation) and those that affect caloric intake (eg, feeding of calorically dense cat foods or free-choice feeding). The epidemiologic studies that have examined risk factors for weight gain in cats have not uniformly found these environmental features to be significantly associated with overweight or obese body condition, although most studies did find that feeding calorically dense commercial foods was a contributing factor for weight gain in cats.^{1,2,15,19} Regardless, for the individual patient, anything that predisposes to a state of positive energy balance by either decreasing energy expenditure or increasing energy intake should be examined and, if possible, addressed. In particular, a portion control rather than a free-choice feeding method may be necessary for many patients.

Accurate accounting of caloric intake

A complete diet history is essential for developing an effective weight loss program for your patients. Not only will it give an accurate account of all foods fed to a pet on a typical day, it will be an opportunity to evaluate all the ways that food is involved in interactions between the pet and the other members of its household, including other pets. The discussion of the patient's diet is also a good time for the caregiver(s) to be given the opportunity to offer their viewpoints regarding the proposition of modifying their feeding practices. Particularly in cases where a weight reduction program may be indicated, it is absolutely necessary to assess the readiness of the caregiver to embark on such a project. If the caregiver does not recognize that a problem exists and does not see the necessity to address it, you will first need to try to bring their point of view into alignment with yours. If they are unwilling to address the problem at the pres-

ent time, perhaps they will be more open to necessary changes at a future time.

The household

Begin by asking about who lives with the patient. How many adults and children are in the household? Are any of them at home all day with the cat? Inquire about whether there are other pets in the home and whether they are, or can be, fed separately from the cat. Can the cat access other pets' food? Find out if it is confined indoors or not; if it does go out of doors, is it supervised when outside? Ask if the cat has the opportunity to steal food, get into garbage, scavenge or hunt (see diet history box, page 331).

The principal diet, feeding routines and eating behaviors

Obtain the precise names (including variety, if appropriate) and brands of any commercial cat foods that the patient is receiving and the specific amounts fed. Often the caregiver will not be able to provide this information accu-

Diet history

- ❖ What specific amounts and type of food (*all*, including treats) are fed?
- ❖ Does the cat drink milk?
- ❖ Is the cat fed 'people' food?
- ❖ Who feeds the cat's regular meals?
- ❖ Do family members routinely feed treats and table scraps?
- ❖ How often is the cat fed? Is the food measured?
- ❖ Does the cat nibble or gorge?
- ❖ Where is the cat fed?
- ❖ Is the cat indoor or outdoor? If outdoor, does it routinely hunt?
- ❖ What other pets are in the household?
- ❖ Do other pets have access to the cat's food?
- ❖ Does the cat have access to the other pets' food?
- ❖ What is the activity level of the cat?
- ❖ Are there any known stress factors in the home environment?

rately by recall alone, and will need to check labels and measure feeding portions. Specify that, if at all possible, dry pet foods be measured with a gram scale. A recent investigation found measuring cups to be a very imprecise means of portioning dry dog foods and it is highly likely that the same would be true for dry cat foods.²⁵ If using a scale to measure the food is not an option, ensure that the client is using a standard 250 ml/8 oz measuring cup. Often people don't recognize that the 'cup' or scoop they are using is in excess of this. If the patient is eating a canned diet ask what size can. Sometimes a specific variety of cat food is sold in different sized cans (eg, 85 and 170 g/3 and 6 oz) so be certain to inquire about what size is used by the client. Don't forget to ask



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whether the food the cat is currently eating is its usual diet and, if not, inquire when the diet change was implemented.

If the patient is eating a commercial cat food find out whether the diet is being supplemented with any human foods. If this is the case, or if the patient is being fed a home-prepared diet, it is important to get accurate details, including measured amounts, of all foods routinely given. Be certain to inquire whether the patient is receiving any dietary supplements. It is useful to have the cat owner bring in the supplements or at least the label information so you can see exactly what nutrients are being supplemented and in what quantities.

Ask whether the patient is fed at certain times during the day or whether food is given free choice. If the patient is fed with other cats or dogs, are the meals supervised? Does one person assume responsibility for feeding the patient or can it vary day to day? This is important to know when you are instituting a weight loss program because you may not be speaking with the person who will be implementing the new plan.

Inquire about the patient's normal feeding behavior. Is this cat a picky eater? Does it eat the food as soon as it is offered or is it content to graze throughout the day? Does the cat usually eat all the food that is offered? Does it beg for food in between meal times?

Treats and supplements

When inquiring about treats, pose the question several times in different ways:

- ❖ Ask which specific commercial treats are used (name, flavor, brand and size).
- ❖ Ask whether human foods and table scraps are given as treats.
- ❖ Ask specifically about products that are used to promote dental hygiene (often people do not consider these things
- treats). Some such products can contribute significant amounts of calories to a cat's diet.
- ❖ Ask whether the patient routinely receives any medications and, if so, whether the medication is given with food or treats.



A 5 kg cat needs 250 kcal/day. 1 cubic inch of cheddar ≈ 28% of daily requirements



This is equivalent to a double hamburger (540 kcal) for someone on a 2000 calorie/day diet

Hidden calories

Treat/dental product	kcal
Typical commercial cat treats	2–4/piece
Dental treats for cats	1–2/piece
'Cat milk' drink	2/tsp
2% milk	9/tbsp
Cheddar cheese	113/28 g
Chicken breast (skinless, roasted)	51/28 g
28 g = 1 oz	

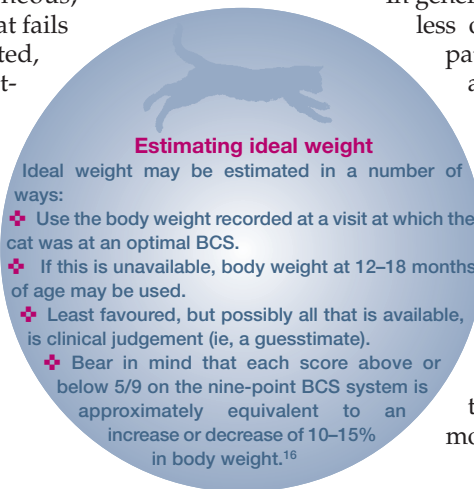
Formulation of the weight loss plan

For a weight loss plan to be successful, the veterinarian needs to consider four key elements: what is fed, exercise, environmental enrichment and recheck visits. The first two determine the necessary negative energy balance; the second two support the psychologic needs and behavioral aspects of cat and owner, to improve ongoing compliance.

Counsel the client to produce a 1–2 week feeding journal into which everyone in the household who gives the cat anything ingestible enters information. The amount and exact type (brand) of food should be recorded. The client can be asked to generate this diet diary before the appointment and bring it along. While it may not be completely accurate, it provides a starting point for determining the caloric intake that the cat has been receiving and gaining weight on. This should be compared with the caloric allowance being recommended. If the diary is erroneous, it will become readily apparent as the cat fails to lose weight when fed the calculated, recommended quantities, and adjustments can be made.

As a rule of thumb, in order to lose weight a cat needs 60–70% of the calories required to maintain its ideal weight. In other words, the veterinarian needs to:

- ❖ Determine/ approximate the cat's ideal weight (see right);
- ❖ Calculate the calories needed for its ideal weight (wt [kg] x 40–50 kcal/kg/day);
- ❖ Multiply this number by 60–70%.



Estimating ideal weight

Ideal weight may be estimated in a number of ways:

- ❖ Use the body weight recorded at a visit at which the cat was at an optimal BCS.
- ❖ If this is unavailable, body weight at 12–18 months of age may be used.
- ❖ Least favoured, but possibly all that is available, is clinical judgement (ie, a guesstimate).
- ❖ Bear in mind that each score above or below 5/9 on the nine-point BCS system is approximately equivalent to an increase or decrease of 10–15% in body weight.¹⁶

Some pet food companies provide software to help with the calculation that are specific to their weight loss diets.

The client should be informed of the cat's current weight, as well as the goal weight. In some cases, the goal weight may be higher than the 'ideal' weight; the goal is a healthy weight. For example, in extremely obese pets (BCS 9/9), even though the weight loss plan will be based on the patient's ideal weight, the client needs to appreciate that a loss of 20–30% body weight (which may represent a BCS of 6/9 or 7/9) will still provide health benefits. While this may not be sufficient weight loss to achieve the ideal weight, interim targets for the client to aim for provide motivation, and the cat's quality of life will be dramatically better even if still overweight.

Discuss with the client the length of time this may take. A safe rate of weight loss is 0.5–2.0% body weight a week. This will help them stay the course.

What to feed

In general, it is not enough simply to feed a cat less of its normal diet. Not only will the patient be unhappy and feel hungry, but all nutrient quantities will be decreased, not just the calories, because commercial diets are balanced according to energy content. Therefore, a cat on a weight loss plan should be fed a diet formulated for caloric restriction that is fortified with all essential nutrients, so that when it eats the appropriate amount of calories, it still meets its protein, vitamin and mineral needs. A possible exception to this might be a cat that is only moderately overweight, in which case

Example weight loss program

Fluffy weighs 8.4 kg and has a BCS of 9/9. She is currently being fed 375 kcal/day. Her ideal weight is 5.4 kg, with a BCS of 5/9.

Estimated calories for maintenance at ideal weight
5.4 kg x 50 kcal = 270 kcal

How much to feed
60–70% x 270 kcal = 162–189 kcal/day
(In order to achieve this lower number of calories, it helps both the cat and the client if the food reduction is made gradually, over a period of 2 weeks)

How long weight loss will take
Weight loss of 3 kg will take at least 12 months. A 10–15% loss (0.8–1.3 kg) or a goal weight of 7.1–7.6 kg will take approximately 5–6 months



As a rule of thumb, in order to lose weight, a cat needs 60–70% of the calories required to maintain its ideal weight.

restriction or elimination of treats along with a modest reduction in the normal diet may be sufficient to permit weight loss. If treats are being eliminated, another non-caloric ‘treat’ (eg, interaction through play, combing or catnip) can be substituted.

There are a number of dietary approaches to feline weight loss:

- ❖ **High protein** protects (minimizes loss of) lean mass, stimulates protein turnover, and may enhance satiety.^{26,27}

- ❖ **High moisture** can reduce caloric density, which promotes short-term weight loss. It can take a few weeks to a few months for a cat to compensate for the lower caloric density (as fed) in canned foods versus dry foods by increasing their volume of food intake; however, not all cats respond in this way.²⁸

- ❖ **High fiber** can reduce caloric density and induce satiety. Some cats will self-restrict calorie intake when fed a dry, high-fiber, low-calorie diet.

- ❖ **Low fat** will reduce caloric density. High-fat diets are a risk factor for inducing obesity and are generally not considered optimum for a weight loss diet. That said, some cats will lose weight on a high-protein, high-fat, low-carbohydrate diet.

Ultimately, it is calories ingested versus expended that is critical for weight loss. Given the benefits of achieving lean body mass by feeding a high-protein diet, a goal of at least 45% protein, on an energy basis, is a healthy approach to take.

Exercise

Caloric restriction alone is, in most cases, inadequate. Incorporating other modalities that increase calorie use and metabolic rate will help to achieve the goal of losing weight. Exercising cats might well be considered an oxymoron, but any exercise will help (Figure 3). Some dedicated clients have even designed agility obstacle courses for their cats. The Association for Pet Obesity Prevention offers some practical suggestions for clients (see resources box, page 335).

It is in a cat’s nature to hunt by a process of slow, patient stalking and then, when opportune, leaping or running involving a short burst of effort and speed. This makes chasing a laser pointer or playing with a ‘cat dancer’ (a hand-held flexible wire with a toy on



Figure 3 Exercise, in any shape or form, will help. Courtesy of (a) Sarah Ellis and (b) Deb Givin

What about treats?

As long as 90% of the dietary intake comes from a complete and balanced food, treats may be fine. In other words, owners shouldn't overdo it. A tablespoon of 2% milk or a couple of cat treats (see Hidden calories table on page 331) may make a cat very happy. In fact, these provide good positive reinforcement when given after taking medication or having nails trimmed. Alternatively, dry kibble can be used as treats for play and exercise. However, these calories must be factored into the total allowance for daily intake, otherwise these few little treats can sabotage a weight loss program.

Using a standard treadmill

It is very important that the client ensures the cat is not discouraged by making the treadmill go faster than a walking pace. Start by placing the cat on the rear of the stationary treadmill and offering a treat at the front of the machine. Over several days, the cat learns to associate walking forward on the treadmill with a positive reward through successful repetition. Turn the treadmill on to the lowest possible speed. Continue to reward the behavior, gradually increasing the speed to a comfortable walking pace for the individual cat. If the cat takes to this readily, the frequency of rewards can be reduced to one at the beginning and at the end of the session. The aim is to have the cat walk on the treadmill for 5–10 minutes.

the end) a very suitable form of activity. (Note that when discontinuing play with a laser pointer, the spot should alight on a toy and be turned off when the cat has pounced on it so that the hunt can be ‘successful’.) It is helpful for owners to coincide the times they choose to exercise their cat with when the cat is naturally inclined to be most active. This tends to be early in the morning or later at night (their ‘crazy’ times!). One can also capitalize on the energy burst that some cats show after using the litterbox.

While the more prolonged and consistent energy required for running on, for example, a treadmill or exercise wheel may seem unreasonable to expect from a cat, some do seem perfectly happy to run on these exercise devices for several minutes at a time.

Others readily take to leash walks. A search on YouTube will reveal numerous entertaining, but also informative, videos of cats exercising. It can be useful to show these to the clinic team and to clients as ideas to consider with their cat.

Clients should be encouraged to move the food bowl every few days so that the cat has to look for it on different levels and in different rooms of the house. Placing tiny portions of the calculated daily ration onto small plates or in muffin liners allows for a ‘treasure hunt’ throughout the day. In addition to a modest challenge and a bit of exercise, eating smaller amounts throughout the day increases the energy utilized to digest and absorb the food (the so-called thermic effect of food). It is important in a multi-cat household to ensure there is enough distance between bowls, to reduce any threat of proximity and competition. Other considerations for the multi-cat household, in which there may be conflicting nutritional needs, are discussed on page 335.

Environmental enrichment

We must also consider why the cat is eating more. Is it bored and sleeping most of the day? Is it not receiving enjoyable stimuli from the day, more healthy sources and, therefore, eating? What other aspects of normal behaviour are not available for the cat to participate in? How is the cat meeting its emotional needs ('hedonic budget')? Chronic stress (which may be present in the indoor-confined cat) results in neuroendocrine changes that predispose to obesity.²⁹

Environmental enrichment has been extensively studied as it pertains to animal welfare.³⁰⁻³⁷ It has also been looked at briefly in the context of how it affects weight loss.³⁸ In a study of 19 two-cat indoor households, where one cat was overweight and the other of normal weight, nine households were randomly selected to be the control group. Their weight loss program consisted of counseling and directions to feed the two cats separately in two or more meals per day, closely monitoring the obese cat's food intake. The goal weight was 90% of the cat's initial weight, which allowed cats to lose 1-1.5% of their initial weight per week. The 10 treatment households received the same counseling and feeding recommendations but, in addition,



Figure 4 Environmental enrichment contributes to weight loss programs by promoting increased activity and, it appears, improving client commitment. Courtesy of Kate Hurley

underwent environmental enrichment. The enrichments consisted of additional food dishes, water bowls and litter boxes, as well as climbing trees, window perches, scratching posts, grooming supplies and toys. All cats (38) were weighed weekly and all wore activity monitors. Cats in the environmentally enriched group had increased activity counts and their caregivers were more positive about the weight loss program. While only a trend towards improved weight loss was noted, environmental enrichment (Figure 4) may be important not only in terms of a cat's mental wellbeing, but also in improving commitment by the client.³⁸

Recheck visits

Weight loss requires commitment on the part of the client. It also requires commitment on the part of the clinic team because the client needs support and a motivator outside of themselves in order to persevere with the program. Success in losing weight often requires behavior changes in the client and the people who interact with the cat (see 'What drives the client?'). Thus, recheck visits (initially every couple of weeks) are an essential part of a successful program. Create a bar graph to maintain in the clinic computer and cat's medical record. Send an updated graph home with the client at every visit as a good reminder of their success. Positive reinforcement is a powerful motivator.

Devices to enrich feeding

There are a variety of commercial products available to enhance the feeding experience by requiring interaction with the device to gain the food (Figure 5a,b). Home-made gadgets can be constructed relatively simply as well. For example, kibble can be added to a series of empty plastic water bottles or other small drinks containers with holes that are gradually made smaller. The bottle with the largest holes is introduced first; once the cat has learned how to roll the bottle to spill the kibble out of the holes, the bottle is replaced by the next in the series. Another DIY option is

to construct a pyramid of cardboard tubes (eg, from paper towel rolls) laid horizontally and glued together (Figure 5c). This requires the cat to reach into the tubes to pull kibble out. Not only does this result in engaged behavior and a reduction in boredom, but it also slows down eating behavior so that the satiety centre may register 'full' before the cat has overeaten.²⁹ Interestingly, an automated pet feeder may have an undesirable effect, as some cats have been observed to become obsessed with the device, apparently waiting for it to open.



Figure 5 A selection of commercially available and home-made feeding devices. For weight control, the food must be measured as part of the daily ration. Courtesy of (a) Deb Givin, (b) Sarah Ellis and (c) Vicky Halls

Weight loss in the multi-cat household

Multi-cat households present a special challenge in terms of behavioral concerns as well as for nutritional planning in health (age and stage) and illness. The goals within a multi-cat household are to:

- ❖ Achieve a feeding strategy that puts no one cat at risk nutritionally through having the base diet available to all; and
- ❖ Meet the individual nutritional needs of each member of the household as closely as possible twice a day behind closed doors.

This requires analysis and consideration of the clowder's needs as well as the individual cats' physical, personality and nutritional profiles.

An overweight cat can be prevented from getting to any food other than that designed for weight loss (the base diet) by putting a latch on a door so that only the thinner cats can get through the narrower space. Should the client be so motivated and have the space, a silhouette box can be constructed that allows the thinner cats through the narrow opening. Note, however, that if a thinner cat is likely to fall prey to aggression from the heavier cat, this situation would allow bullying to develop. Another solution might be to consider using elevations if the heavier cat is unable or unwilling to jump, allowing the thinner cat (if that individual is able) to eat on a perch or another raised and stable location.

What drives the client?

A fascinating study by Kienzle and Bergler found that the emotional rewards/reinforcement that a client gets from interacting with their cat (the 'positive strokes'), and the behaviors of clients towards their cats, differ with the cat's weight.¹⁷ These investigators found that more people living with overweight cats (versus cats of normal weight) had adopted their cat for emotional support and concluded that these individuals tended to humanize their cat companions. They underestimated their overweight cat's BCS and enjoyed watching their cat eating. People with cats of normal weight played more with their cats. Surprisingly, the number of meals, snacks and types of food did not differ between the households; however, overweight cats received more treats, while normal-weight cats received a greater proportion of canned food.

So, in a cat's weight, there is an element of meeting the hedonic budget for the person living with the cat. Hence, it is essential that we address the behavior of the people living with and feeding the cat! The value of encouraging alternative 'strokes' – things that make the person feel good about their interactions with the cat, such as play and a sense of pride in achieving weight loss goals – is not to be underestimated. Positive feedback, both from the veterinary team (the outside environment) as well as self-generated by the client, is vital to the success of a weight loss program.

The behavior modification required to make a weight loss program successful needs all key family members to play a role. Are there other forms of interaction that the client can have with the cat besides feeding? Treats are the downfall of many a weight control program; when used, their calories *must* be taken into consideration and deducted from the food calories fed. In order to decrease the risk of too many calories being fed, it is simpler if one

KEY POINTS

The first step towards a healthy weight for an overweight or obese cat is recognizing excess body condition. Thereafter, success in achieving weight loss requires:

- ❖ A cooperative approach between the cat's family and the clinic team.
- ❖ Understanding what quantity and type of food and treats are to be fed.
- ❖ Encouraging some form of exercise.
- ❖ Enriching the home environment and providing supportive follow-up.



person handles all of the feeding and others bond through other means (catnip, combing, playing). As described earlier, feeding multiple small meals as a treasure hunt is beneficial. Developing a routine involving several periods of play a day will add interest and exercise to the cat's life. The cost of the program might just then include a bag of catnip and a cat dancer!

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Resources for clinic and clients

- ❖ Indoor pet initiative – for advice on enrichment of the life of the indoor cat: <http://indoorpet.osu.edu/>
- ❖ Association for Pet Obesity Prevention (APOP): www.petobesityprevention.com
- ❖ APOP pet weight translator (to convert a cat's weight to an approximate equivalent human weight): www.petobesityprevention.com/pet-weight-translator
- ❖ The Cat Wheel Company – distributor of a cat exercise wheel: www.catwheelcompany.com
- ❖ Blog about cat wheels – different varieties and building your own: <http://jillyotz.blogspot.com/2011/01/how-to-build-cat-exercise-wheel-part-1.html>

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Conflict of interest

Kathryn Michel is a member of the Purina Scientific Advisory Council.

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