

# Diet and exercise patterns in pet dogs

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**Summary:** A study was conducted to provide baseline data on pet dog diet and exercise patterns. In addition, the repeatability of a telephone questionnaire to determine these patterns was evaluated. Dogs seen at the Texas Veterinary Medical Center that were less than 3 years old and of medium, large, or giant purebreeds or mixed-breeds were included. Information was collected about background variables, brands, quantities, and types of foods fed, and types and frequency of exercise. Daily intake of metabolizable energy, calcium, fat, and protein were calculated from the diet. Sixty-nine dog owners completed the study. Most dogs were kept as pets in an urban/suburban environment. Most were also fed dry food. About 60% were fed dog biscuits or some other dog snack or treat, and about half of the dogs in the study were fed twice daily. Meat scraps and bones were the table foods most commonly fed. Most owners considered their dogs to be moderately or very active. Greater than 70% of the dogs were confined to a fenced yard. About 65% of the owners took their dogs for walks. Forty percent of dogs in the study exercised with other dogs daily. More than half of the owners reported playing retrieving games with their dogs, including playing with a flying disk. The questionnaire was shown to be repeatable.

Information about typical feeding and exercise patterns of pet dogs is scarce. However, these data are vital to understand and study diseases for which diet and exercise may be predisposing factors. Diet has been implicated as an important factor in obesity, metabolic bone diseases in young dogs, inflammatory bowel disease, skin problems, and chronic diseases such as heart and kidney disease and cancer.<sup>1-11</sup> The pet food industry has continued to market various diets for healthy dogs as well as diets that are specially designed for the needs of young, old, less active, or working dogs.<sup>3,12</sup> In addition, increased owner interest and level of sophistication about the nutrition of their pets has added to the importance of including data regarding diet and nutritional state in the assessment of each dog examined by a veterinarian.<sup>13,14</sup> To understand the effect different diets have on a dog's health, epidemiologic studies evaluating the associations between diet and disease are necessary. These studies require accurate baseline descriptive data (beyond tons of food bought or total dollars spent on

pet foods) for their planning and implementation. Therefore, information on the types of foods, frequency of feeding, and typical total and nutrient intakes needs to be collected as a first step in studying these associations.

Exercise, or the lack thereof, also may affect the health of pet dogs. Too little exercise is probably a contributing factor to the growing problem of obesity in pet dogs.<sup>4</sup> However, vigorous or rough exercise may be a predisposing factor for the development of osteochondritis dissecans or other metabolic bone diseases (eg, panosteitis, hypertrophic osteodystrophy) in young, growing dogs.<sup>5,15-17</sup> Exercise also may exacerbate hip dysplasia, osteoarthritic conditions or other degenerative joint diseases in older dogs.<sup>4</sup> To understand the relationship between exercise and health, information on usual frequency and types of activities must be collected.

The objectives of the study reported here were to provide data on diet and exercise patterns in dogs in central Texas, evaluate the repeatability of a revised telephone questionnaire on diet and exercise, and compare similar information to a previous study in New York.

## Materials and Methods

**Subject selection and interview**—The study was designed to assemble a group of dogs that would be comparable to that previously studied at Cornell University.<sup>11</sup> All dogs in the study were less than 3 years old and were of both sexes. Purebred medium, large, or giant breed dogs or mixed-breed dogs of any size were included. Dogs that had terminal or severely debilitating diseases (including heart or renal failure, CNS disease, or severe trauma) were excluded, because the diet and exercise patterns might be atypical of young pet dogs. Owners of pet dogs fulfilling these criteria who were clients at the Texas Veterinary Medical Center between January 1991 and March 1991 were eligible to participate. A letter was sent prior to the interview, informing each pet owner that a telephone interview study on diet, exercise, and general pet health was being conducted. The purposes of the letter were to prepare the owners for the telephone interview, assure them of confidentiality, and request their participation. The owners were called, and those who agreed to participate in the study were interviewed.

An interviewer was recruited who had owned pets and worked in a small animal veterinary practice. She was trained in the proper way to conduct the interview, supervised for 3 to 5 interviews, and monitored several times during later interviews. Interviews lasted 10 to 20 minutes, depending on the amounts of table foods fed.

**Questionnaire design**—The questionnaire<sup>a</sup> included questions on background variables (age, breed, gender, and environment), foods usually fed (brands, quantities, and types), and exercise (usual activities and duration). The dietary questions included information on commercial dog and table foods. The specific types of dog foods listed for the owners were canned, dry (from grocery stores), specialty dry (from outlets other than grocery stores such as pet stores and veterinary clinics), semimoist products, combination dry, and semimoist treats (including dog biscuits and other dog snacks). Lists of different types of table foods (eg, meats, cheeses, and vegeta-

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**Table 1—Repeatability measures of dietary data from 2 telephone interviews of pet dog owners and frequency data from the first interview**

Variable	Kappa	Percentage*
Dog foods (yes/no)		
Canned	0.94	16
Dry	0.65	51
Special	0.71	45
Treats	0.69	61
Meats (yes/no)		
Chicken	0.43	19
Juice	0.43	15
Beef	0.72	27
Trimming	0.52	19
Other foods (yes/no)		
Bones	0.54	30
Bread	0.66	22
Cheese	0.64	22
Hot dogs	0.62	19
Miscellaneous foods (yes/no)		
Hunts for food or raids garbage	0.67	25
Supplements	0.76	12
Table food	0.74	56
Times fed per day	0.95†	
Once		26
Twice		50
Three		1
≥ Four		21

\*Percentage of owners who responded yes to these variables during the first interview.  
†Spearman's rank correlation coefficient.

bles) were read to all owners to improve recall on the feeding of these foods. Questions about the frequency of feeding and sources of food outside the house (hunting or scavenging) were multiple choice. The dietary section of this questionnaire was previously evaluated and shown to be repeatable and valid.<sup>18</sup>

The exercise questions were multiple choice. Questions were asked about general activity level of the dog, where the dog spent its time, the frequency, duration, and usual pace of on- and off-leash walks and the frequency of activities such as playing with other dogs or retrieving games including playing with a flying disk. The questions about on- and off-leash walks were previously shown to be unrepeatable<sup>18</sup>; therefore, these questions were modified for this study to be more qualitative and to have fewer answer categories. The duration of on-leash walks was changed to ask about the usual purpose of the walk (for exercise, for the dog to relieve itself, or at shows or trials). The answer categories for the pace of on-leash walks was reduced to 2 choices: walking or running/jogging. For off-leash walks, the answers for the pace were reduced from 4 to 3 categories: walking, walking and some running, and mostly running. A question about retrieving including playing with a flying disk was added to account for this popular form of exercise.

**Data analysis**—Descriptive information about each question was summarized, using the percentage of owners who responded yes to each question in the first interview. Data on the feeding of specific table foods was summarized and reported only if at least 15% of the dogs (10 dogs) in the study were fed that particular food.

The repeatability of each question and of total dietary calories, calcium, fat, and protein was evaluated by use of the test-retest method. This involved the administration of the same questionnaire to the same respondents concerning the same period on 2 occasions.<sup>19</sup> The repeatability of the dietary questions was evaluated for specific foods, based on agreement between responses to the first and second questionnaires in regard to whether a food was fed or not. Metabolizable energy (Kcals), calcium, fat, and protein were calculated from the foods reported by the owner. The intakes of these 4 variables also were compared between the first and second interview for repeatability. The multiple choice questions concerning exer-

**Table 2—Summary data for calorie and nutrient intake, on a per kg basis, obtained during the first telephone interview, stratified by the age of the dog at the time of interview**

Variable	Dogs ≤ 12 months	Dogs > 12 months
Calories (median)	73	56
range Kcals/kg of body weight	29 to 1,595	11 to 171
Calcium (median)	234	150
range mg/kg of body weight	98 to 4,447	17 to 624
Fat (median)	3	3
range g/kg of body weight	3 to 23	1 to 12
Protein (median)	5	3
range g/kg of body weight	2 to 124	1 to 12

cise were evaluated by comparing responses between the 2 questionnaires.

The repeatability of questions with 2 answer categories (dichotomous) was analyzed using the Kappa statistic. Variables with 3 categories were evaluated, using an overall Kappa. Guidelines for interpreting Kappa were: excellent agreement if Kappa was greater than 0.75, fair to good if Kappa was from 0.4 to 0.75, and poor if Kappa was less than 0.4.<sup>20</sup> For variables with 4 or more ordered categories as answers or that had a continuous response (including nutrient amounts), repeatability was analyzed, using Spearman's rank correlation coefficient, because these data were not normally distributed. Correlations of 0.5 to 0.7 were considered good.<sup>19</sup>

The total calorie and nutrient content in the diet consumed by each dog daily was calculated, using a commercial computer program,<sup>b</sup> which estimated and summed nutrient amounts from all foods fed. The intake of total calories, calcium, fat, and protein were calculated for each dog, using results of the questionnaire. Commercial dog and table foods in the program were updated and added to the program whenever possible, using information supplied by the manufacturers or the product labels (commercial dog foods) or a standard reference for human dietary data.<sup>21</sup> For the few dog food brands for which nutrient information was unavailable, values for a standard brand for each type and variety of food were used.

## Results

Sixty-nine dog owners completed both repeatability interviews. The overall response rate was 73% (69/95). The reasons for nonresponse were as follows: 18 owners had incorrect addresses or telephone numbers; 1 owner could not be contacted during the study; 1 only had completed a single interview; and 6 owners declined to participate. Among the owners contacted, 91% (69/76) completed both questionnaires. The median time between the interviews was 60 days (range, 41 to 111 days).

Most dogs in this study were kept as pets in an urban or suburban environment (Appendix). Slightly more than half were female. Owners had owned their dogs for a median time of 12 months and a mean time of 18 months (minimum of 2 weeks) at the first interview.

Owners were able to consistently report what type of dog food and whether their dogs were fed beef, bread, cheese, and hot dogs (Table 1). Only 1 dog was fed semimoist or combination dry and semimoist food. Owners could repeatably describe whether supplements (mostly multivitamins) or table foods in general were fed and how many times per day the dog was fed. Only 13 owners specified a brand of dog food for which a standard brand was substituted for the actual brand (2 canned, 7 dry, and 4 specialty dry). Calculated calories and nutrients in the diet also were consistent between the diets described in the first and second interviews. Spearman's

**Table 3—Repeatability measures of exercise data from 2 telephone interviews of pet dog owners and frequency data from the first interview**

Variable	Response	Agreement*	Percentage†
Activity level	Sedate	0.73	6
	Moderate		46
	Very active		48
Where kept outside	Tied	0.89	4
	Kennel		15
	Yard		71
	Loose		10
Number of hours outside/d	< 3	0.56	22
	3 to 10		32
	11 to 20		17
	> 20		29
Surface when inside	Floor	0.94	16
	Carpet		72
	Crate		12
Surface when outside	Concrete	0.88	15
	Gravel		4
	Dirt		13
	Grass		68
Leash walks	yes/no	0.90	67
	Frequency during a week	0.74	9
Reason for walk	1 to 2	0.87	20
	3 to 7		54
	> 7		17
	Urinate, defecate		11
Speed of walk	Exercise	0.77	80
	Shows		9
	Walk		54
Off-leash walk	Jog	0.76	46
	yes/no		65
Frequency of walks during a week	< 1	0.71	20
	1 to 2		16
	3 to 7		40
	> 7		24
Usual duration (min)	< 10	0.62	9
	> 10		91
Activity level off-leash	Walk	0.75	15
	Some run		33
	Mostly run		51
Playing with dogs during a week	Never	0.82	19
	< 1		10
	1 to 3		20
	4 to 6		6
	7		7
Retrieving/playing with a flying disk	> 7	0.87	38
	yes/no		62

\*This value is a Kappa statistic if there are ≤ 3 categories for that variable, otherwise it is a Spearman's rank correlation coefficient. †Percentage of owners who responded yes to these variables in the first interview.

rank correlation coefficients were 0.85 for metabolizable energy (Kcals), 0.85 for calcium, 0.79 for fat, and 0.84 for protein. The median intakes reported during the first interview were also calculated (Table 2). The highest upper end of the range for the nutrients was attributed to a 22-kg dog whose owner reported during the first interview that the dog was fed 12 cups of dry food daily.

All of the information on exercise indicated good to excellent agreement between the responses of the owners during the first and second interviews (Table 3). Most owners considered their dogs to be moderately or very active. Many owners reported playing retrieving games with their dogs, including playing with a flying disk. Greater than 70% of the dogs (49 dogs) were confined to a fenced yard. About two-thirds of the owners took their dogs for walks. Twenty percent (14/69) of the dogs did not exercise with other dogs.

Background variables for this study were similar when compared to the previous study done at Cornell University.<sup>18</sup> The percentages of purebred dogs in both

studies were within 5%, the percentages of dogs that were pets and the median ages were equal, the percentages of males and females were within 10%, and the median weight was within 4 kg. The percentage of dogs fed dry, special dry, semimoist, or combination foods were within 5%. A larger percentage of dogs were fed treats (79%) and table foods (90%) in the Cornell University study than in the present study. Most exercise questions were not directly comparable. For those that were, the percentages of owners who walked their dogs on- or off-leash were within 2% for both studies. The percentages of calm/moderately active dogs were within 3%, and for the categories of playing with other dogs, there was less than a 7% difference between the 2 studies.

### Discussion

The results of this study indicate that owners of young dogs can consistently describe the typical diet and exercise patterns of their pets. Owners only had some trouble reporting a few of the table foods such as chicken and meat juices. It is possible that these foods are fed sporadically and are, therefore, more difficult for owners to recall. However, the actual calorie and nutrient intakes were repeatable.

The activity levels reported were consistent with the working origins of the more common breeds in this group and the young age of the dogs. The high percentage of owners who consider themselves to live in an urban/suburban area may account for the large percentage of dogs that lived in fenced yards. Dogs who exercised frequently with other dogs may have lived with other dogs or been routinely taken to areas where other dogs were present. Retrieving games were important to be able to quantify because these are high energy and involve the dog in repetitive, physically demanding activities.

Based on results of this study, there is a moderate amount of variability in the frequency and types of exercise for young dogs. For most exercise questions, at least 2 and sometimes 3 answer categories had a substantial proportion of owners who reported that their dog fit into that answer category. This implies that these exercise questions could be used to rank dogs and evaluate differences in exercise that could be associated with various disease problems.

There have only been a few reports of dietary patterns in pet dogs. One study looked at number of daily feedings and offering of tidbits as potential causes of behavioral problems.<sup>22</sup> That study included a haphazard voluntary sample of 1,422 owners from various parts of the United States. The survey found that 46 and 12% of owners reported feeding once daily and 3 or more times daily, respectively. This difference from the present study may be attributable to the wider variety of ages and breeds in the behavior survey or to regional variation. Also, there was about an 8-year difference between the studies, and feeding patterns may have changed. Seventy-nine percent of owners reported feeding tidbits. This higher percentage may have been attributable to owners including dog treats as well as table foods as tidbits. A somewhat higher percentage of respondents (74%) were in urban or suburban environments, compared with the present study. Because the main focus of that survey was not diet and exercise patterns, only a

few questions pertained to those factors. Nutrient information was not available, and there was no evaluation of repeatability of the data. There were no questions pertaining to exercise patterns.

Another study has been reported on the effects of dietary components on breast cancer in dogs.<sup>10</sup> A telephone questionnaire was used to evaluate the relationships between obesity, total calorie intake, high fat intake, high protein intake, and risk of breast cancer. Data on caloric intake was reported for the female dogs over 5 years old that were enrolled in the study. However, data on actual fat and protein intake were only reported in the author's thesis.<sup>6</sup> For calories, fat, and protein, the dogs in the breast cancer study had lower intakes than in the present study. This may have been attributable to the age differences of dogs in the studies. Information on patterns of feeding types of dog foods was not presented. Validity, but not repeatability, of the questionnaire was reported.<sup>10</sup>

Two British studies evaluated obesity in pet dogs.<sup>23,24</sup> As part of the survey completed by the participating veterinarians, diet was assessed. Neither study evaluated the repeatability nor validity of the survey. The first study asked only about the feeding of canned meat, home prepared foods, and dog biscuits or dog meal.<sup>23</sup> The second study asked about types of foods and also an estimation of the proportions in the diet of canned, semimoist, dry, fresh, and table scraps.<sup>24</sup> Most dogs were fed large amounts of canned and dry food mixed. About 29% of dogs (2,389/8,268) received table scraps, and about 10% of dogs (802/8,268) had unknown diets. The present study indicated a higher level of feeding dry food and table foods. There were not sufficient data to calculate nutrient intakes. Variations in feeding patterns attributable to differences in commercial food preparations and sales might be expected between Great Britain and the United States.

In the present study, repeatability of the dietary variables was as good or better than in the previous study for all variables examined.<sup>18</sup> There was more consistency in the types of commercial dog foods fed in Texas, which may have improved repeatability. For table foods, the improvement could have been attributed to the fact that few owners fed these foods and these owners were better able to report the frequencies. Improved interviewer training in eliciting all types of table foods fed including mixed dishes such as casseroles also may have been a factor.

The revised and expanded exercise sections were much improved, compared with the previous questionnaire. Owners were able to consistently describe their dogs' activities. Exercise questions that were unchanged (activity level, on- and off-leash walks, and playing with other dogs) showed as good or better agreement in the Texas study compared to that at Cornell University. Because most exercise questions were revised for this study, direct comparisons of exercise patterns between the 2 studies were not possible. This component of the questionnaire provides repeatable information on the usual types of exercise and times spent on different activities by young pet dogs in a suburban environment. This questionnaire allows an investigator to use telephone interviews to collect information on the activity level of dogs, which would be of value for studies on

metabolic bone disease or osteoarthritis. These questions also could be used to quantify exercise or rank dogs, based on activity levels, for studies on obesity and optimal nutrition.

This study evaluated dogs with similar demographics to a study conducted among clients at Cornell University.<sup>18</sup> The only substantive differences in dietary patterns identified in the 2 studies was that dogs from the Texas Veterinary Medical Center were fed table foods and dog treats more often than those from Cornell University. For table foods, this likely reflects a true difference in management, because of the consistency of the decrease in each table food category fed. For treats, this may be a real decrease or could be caused by an owner's reluctance to admit to feeding treats. Demonstration that the revised questionnaire provided repeatable data in 2 regions supports our belief that this instrument can be used in a variety of settings. In addition, because the results of the study at Cornell University were similar to this study, the data are likely to be generally representative of the diet and exercise patterns of large and giant breed, young dogs in urban/suburban environments.

Overall, this study provides additional, repeatable information on the types and amounts of foods fed and typical exercise patterns in this subpopulation of young, large or giant breed pet dogs. These types of data are critical when designing observation and intervention studies on the effects of diet and exercise on disease frequency or prevention. This questionnaire should prove to be a useful instrument in collecting dietary and activity data on pet dogs in different parts of the country. Its repeatability and validity in older dogs and smaller breeds will require further exploration. However, it is likely that the questionnaire will perform as well in these subpopulations.

## Appendix

Background information on 69 pet dogs\* in a study of diet and exercise in central Texas

Variable	No. (%)
Purebred dogs†	45 (65)
Labrador Retriever	11
Australian Shepherd	6
Boxer	6
Golden Retriever	6
German Shepherd Dog	4
Rottweiler	4
Australian Heeler	2
Mixed-breed dogs	24 (35)
Reasons owned	
Pets	60 (87)
Show/field/guard dog	9 (13)
Sex	
Male, sexually intact	15 (22)
Male castrated	13 (19)
Female, sexually intact	14 (20)
Female spayed	27 (39)
Environment	
Rural	25 (36)
Urban/suburban	44 (64)
Age	
< 12 months	20 (27)
12 to 18 months	22 (32)
> 18 months	27 (41)

\*Median weight 25 kg (range, 4 to 59 kg). †Purebreds also included 1 each of the following: German Shorthair Pointer, Great Pyrenees, Old English Sheepdog, Schnauzer, Shetland Sheepdog, and Siberian Husky.

<sup>a</sup>These data are available from the first author.

<sup>b</sup>Animal nutritionist, version 2.5, N-Squared Inc & Durango Software, Silverton, Ore.

<sup>c</sup>Sonnenschein EG. *A case-control study of nutritional factors and spontaneous breast cancer in pet dogs*, PhD Thesis, University of Michigan, Ann Arbor, 1988.

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