

Riskfactors associated with the development of obesity in dogs in the Netherlands

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Introduction

Obesity in dogs is a severe problem. The national information centre for companion animals (LICG) in the Netherlands estimated that of the 2 million dogs about 35% is currently overweight. According to them, this number is rising (LICG, 2010). In other countries this problem is also seen. For example, Pedigree UK estimated that 43% of the dogs in the United Kingdom are overweight (Pedigree, 2015) and in the US this number was proven to be around 34% (McGrevvy, 2005). These high numbers indicate that this problem spreads out worldwide and needs to be stopped. In order to do this more insight in the development, especially the owners' role in this, is necessary. By gaining more information concerning overweight and obesity, a better cure, and hopefully prevention programmes will be developed thus stopping the increasing prevalence of this severe problem.

The definition of obesity describes it as a situation where an accumulation of an excessive quantity of fat in the body takes place (Markwell, 1990). This is a result of an imbalance between the intake and usage of calories; when the intake is higher, the body stores these extra calories as fat. Bodyweight increases as fat accumulates, and a relationship between these factors is easily seen (Alpert, 2001). In humans, mild obesity is defined as a state where the actual body weight exceeds the optimal body weight by 15-30%. This is defined as such because weight is easier to measure than fat percentages. In veterinary medicine a similar definition is used for dogs: an excess of 15% over the ideal bodyweight is defined as mild obesity (Lewis LD et al., 1987). Just as in humans, the number of obese individuals is rising (German AJ, 2006). Currently, the amount of overweight dogs in The Netherlands is considered to be similar to that in other countries (i.e. 40–50%) (Courcier, 2010). As a practical means of measurement concerning patients' weight the Body Condition Score (BCS) is often used. Two different scales are mostly applied separating different 'body-groups' from severely underweight to morbidly obese. These scales range from 1-5 or 1-9, both sharing the same principle; animals with an ideal weight score right in the middle of the scale (3 for the 1-5 scale, 5 for the 1-9 scale), underweight animals score lower and overweight animals score higher.

In order to develop obesity, a dog must either consume too many calories, or burn too little. This means that there are very many possible ways for a dog to become obese. Malnutrition and too little exercise are two commonly seen causes (Osto, 2015). However, it can also be the consequence of neutering, metabolic-endocrine abnormalities, different diseases such as hypopituitarism, cerebral/cortical/hypothalamic lesions, insulinoma, Cushing's and hypothyroidism, genetics, age associated pathologies and/or restrictions or ignorance of the owner regarding a healthy lifestyle. Even emotional trauma is described as a possible cause for the development of overweight (Sibly, 1984).

This is important to know, as prevention is always preferred above treatment. Much research has been done in order to get a clearer view of the high-risk groups predisposed to develop obesity. I.D. Robertson saw in 2003, after interviewing 657 dog-owners, that overweight dogs had higher odds of being neutered, were fed snacks and were given their regular food just once a day. Also, overweight dogs lived mostly in single-dog households. Furthermore they found that for each year of age, the odds of obesity increased (OR=1.1, meaning that exposure to (higher) age(s) is associated with higher odds of developing obesity)

(Robertson, 2003). E.L. Streiff et al. showed that in home-prepared food the percentages of fat, energy and protein were significantly above AAFCO (The Association of American Feed Control Officials) recommendation, which makes home prepared diets also a risk-factor. (Streiff., 2002)

A high percentage of fat in dogs can lead to severely damaging consequences/diseases:

- metabolic abnormalities: hyper-/dyslipidemia, insulin resistance, glucose intolerance, metabolic syndrome, hepatic lipidosis
- endocrinopathies: hyperadrenocorticism, hypothyroidism, diabetes mellitus, insulinoma, hypopituitarism, hypothalamic lesions
- orthopaedic disorders
- cardiorespiratory diseases
- urogenital system disorders
- neoplasia
- functional alterations, for example in joints or blood pressure

(German, 2006)

Breathing problems are a result of a decrease of the tidal volume per kg and H-pen300 induced by obesity whereas the lowering immunostatus can be explained by the raise of concentration leptin (Manens, 2011., Van der Velde, 2013). Furthermore a decrease in mitogen-induced proliferation of T-lymphocytes is seen in obese dogs, altering the immune response. These examples show the diversity of the problems caused by obesity and the risks thereof. Tvarijonavičiute et al. (2012 & 2013) showed in various research papers that losing weight could help.

Losing weight reverses renal failure (Tvarijonavičiute, 2012) and it increases the acetylcholinesterase, but lowers the butyrylcholinesterase concentration in the blood (Tvarijonavičiute, 2013). Also, after weight loss a decrease in systolic blood pressure, cholesterol, triglyceride and fasting insulin was seen, whilst plasma total adiponectin increased (Tvarijonavičiute, 2012). Treating obesity by making the dog lose weight through special diets and an increased amount of exercise has a positive influence on the health of the dog (Warren, 2011). This will result in less clinical manifestations, and therefore a better welfare of the dog. However, many owners have trouble making their dog lose weight.

Despite the large amount of research done, the need for more knowledge on obesity in dogs is still relevant. Over time an increase in prevalence of obesity in dogs has been seen worldwide despite previous efforts and the necessity for a definition of certain risk-groups, if possible, is clear. A study recently done in Bangkok by the University Utrecht on these risk-groups and -factors concluded that the perception of control of the owners towards their pet dogs concerning feeding and exercise regimes greatly contributed to the prevention of obesity in the Thai population (Soontararak, 2013). It concluded that the quality of life (QoL) in obese dogs was compromised in various dimensions (such as social and physical) and that the owners are the key factors in the life of the dog to enhance the QoL. This is because perception of control in feeding and exercise greatly contributed to obesity prevention in the Thai population (Soontararak, 2013). This study was done using a questionnaire which was based on two separate researches done by Rohlf et al. and Schneider et al., both done in 2010.

Rohlf et al. looked at different factors concerning the owner's attitude and beliefs in feeding and exercise regiments and their possible influences on the development of obesity in dogs (Rohlf, 2010). It should be noted however, that this research is based on sick dogs in general and that the assessment developed is not specifically aimed towards dogs with obesity. Soontarak also concluded this after her investigation. Schneider et al. investigated the QoL and human-animal bonds in order to develop a reliable and valid means of assessment when it regards these two aspects, concluding that assessing multiple components of the QoL could provide predictions of dog health ratings and possible health evaluations of ill companion dogs and thus support veterinarians in providing better health care for dogs (Schneider, 2010). Soontarak succeeded in developing a questionnaire based on these two researches and their conclusions in order to ascertain enough data for the study done in Thailand. For practical means, as well as comparative, we will use the same questionnaire (translated for the Dutch population) as well as the 1-5 BCS-scale for this paper (see appendix 2). In this scale BCS3 coincides with an ideal body weight, BCS4 means mild overweight and BCS5 obese.

As described above the questions in the questionnaire originate from two different studies. Both studies identified different factors each consisting of various amounts of questions. In the results we use abbreviations for these factor-groups. Factors like General sickness and Immobility are used the same way as they were in the studies of Rohlf et al. and Schneider et al. (Rohlf (2010), Schneider (2010)). For practical reasons we will use the following abbreviations:

Group name	Abbreviation	Questions
General sickness	GS	1-10
Immobility	I	11-18
External irritation	EI	19-20
Anxiety when owner leaves	AWOL	21-23
General anxiety	GA	24-26
Dog focused aspects to sociability	DFAS	27-30
Sociability	S	31-32
Basic needs	BN	33-34
Sleep area	SA	35-36
Ambivalence about knowledge concerning feeding	AOKCF	37-41
Feed to please	FP	42-44
Owner-centered/external barriers to feeding	OCEBF	45-48
Dog-centered barriers to feeding	DCBF	49-51
Control belief over feeding	CBF	52-54
Value of exercise	VE	55-59
Lack of knowledge concerning exercise	LKCE	60-62
Dog-centered barriers to exercise	DCBE	63-65
Owner-centered barriers to exercise	OCBE	66-72
External barriers to exercise	EBE	73-75
Control belief over exercise	CBE	76-78

An attempt will be made in this experiment to duplicate the study described above, thus creating a platform on which to base prevention programmes in order to fight the onset of overweight and obesity in pet dogs in the Netherlands. The focus will be put on the owners' attitude towards the dogs and possible relationship with the onset/development of obesity as a result, seen as a change in an owner's attitude towards the dog is very likely to not only change the dog's diet but also their exercise regime as well as many other factors involved in the dog's quality of life and wellbeing. This we will do by assessing both the owner's attitude towards the dog and the QoL of the dog in relationship to the BCS of the dog.

We use (same as Soontararak) the QoI as a means of measurement to indicate the possible well-being of an individual. This can be used for both humans and animals. Even though there is some conflict about the definition, researchers agree that it helps promoting better animal life (Soontararak, 2013, Yeates, 2009).

Hypothesis

As stated above, many articles have been published on the population most at risk to develop obesity. Most often certain breeds (for example see Corbee "Obesity in show dogs") or different age-groups (Laflemme, 2005, Kealy, 2002) are compared to determine which has the highest potential to develop obesity. Our hypothesis is that we can identify evidence relating owners' attitude with the BCS of their dog.

We predict a relation between a higher QoI with a lower BCS. Furthermore, we expect to see a higher BCS in dogs with lower educated owners, as well as a causal link between the owners' attitude and the onset of overweight and obesity.

Materials and method

As the results from this research were meant to be compared with the dataset gained in Bangkok (Soontararak, 2013), the same means of data-collection was used to obtain the data in a comparable way. For this to be possible, a translation of the questionnaire was needed in order to make it accessible for the common people and dog owners in The Netherlands. Consequently the formulation of the statements had to be altered to fit the Dutch language, however careful consideration resulted in a questionnaire providing a comparable dataset (see appendix 1).

Using e-mail and telephone 55 veterinary practices (in Amsterdam, Groningen, 's Hertogenbosch, Hulst, Axel, Hengstdijk, St. Jansteen, Maastricht, Utrecht, Hilversum, Huizen, Bussum, Laren, Blaricum, Zeist and Bunnik) were contacted with the question whether they wanted to participate in the study. They were asked to hand out the questionnaires to owners of which the dogs had no illness or affliction that impacted their movement and/or eating patterns. Also, they were requested to examine the BCS of the dog involved and note it at the beginning of the questionnaire. Only dogs with a BCS of 3, 4 or 5 out of 5 were applicable for this study. During data gathering careful consideration was taken in order to prevent bias or any other unwanted selection criteria. After an agreed amount of time (4 weeks) we collected the questionnaires filled in by the owners. However, it was clear quickly that of the 20 participating practices only about 10 actively handed out the forms and that that would not result in the necessary amount of questionnaires, as on average one practice was able to produce 3-4 usable questionnaires. On top of that, 6 veterinary practices withdrew from the experiment, resulting in a further decrease in anticipated results. Eventually 13 filled-in and useable questionnaires were collected after 2 months.

As a new approach, owners were approached on a broader scale by going to "The Day of Healthy Weight" which was organised in Utrecht, as well as visiting trimming salons, dog forums on the internet and by personally talking to people out in parks, on the streets and in the city.

A lot more people were found willing to participate and all were visited in order to assess the BCS by a veterinarian, veterinary assistant or veterinary student. This more personal approach resulted in a significant increase of useable questionnaires, however this happened at the cost of the delicate selection process as such that a few had to be excluded from the data as the dogs were suffering from illnesses or diseases that affected their movement or eating patterns.

As will be clear when looking at the questionnaire as attached to this article, a continuous scale was used to assess the owner's view on the statements as was done in Thailand. Using the same ruler, all intersecting lines indicating an owner's point of view on the matter were measured and translated to a scale of -5 to 5, with the 0 indicating a neutral answer. As opposed to the Likert-type scale, this means of assessment provides us with continuous data as opposed to the categorical data from a Likert-type scale. This way the concern that the intervals between the scale values are not equal is no longer applicable to this dataset making parametric statistics possible (Jamieson S. (2004)). This same continuous scale was used by Soontararak making both datasets statistically comparable. With two statements the owners were given the option to fill in N/A when it concerned either a flight of stairs or a car, in case they didn't have one or the dog was not allowed on or in them.

Results

Table 1. Descriptives of owner and dog information.

Variable	Total summary N=200	BCS			p Value
		BCS =3 N=72	BCS =4 N=76	BCS=5 N=52	
Owner?					
Yes	93.5	95.8	90.8	94.2	0.243 ^b (0.193)
Care taker	1.5	0.0	1.3	3.8	
Other ^a	5.0	4.2	7.9	1.9	
Total	100.0	100.0	100.0	100.0	
Owner gender					
Male	28.0	23.6	27.6	34.6	0.402
Female	72.0	76.4	72.4	65.4	
Total	100.0	100.0	100.0	100.0	
Education level					
Graduated primary school	2.5	0.0	2.7	5.8	0.012^b (0.008)
Graduated VMBO/MAVO/LBO	7.0	2.8	6.7	13.5	
Graduated MBO	20.1	13.9	20.0	28.8	
Graduated HAVO/VWO	20.6	19.4	26.7	13.5	
Graduated HBO/WO	49.7	63.9	44.0	38.5	
Total	100.0	100.0	100.0	100.0	
Marital status					
Not married	29.5	25.0	27.6	38.5	0.423 ^b (0.423)
Married	46.5	45.8	50.0	42.3	
Living with a spouse	17.5	25.0	15.8	9.6	
Divorced	4.0	2.5	3.9	5.8	
Widowhood	2.5	1.4	2.6	3.8	
Total	100.0	100.0	100.0	100.0	
Having Children					
No	50.5	54.2	44.7	53.8	0.443
Yes	49.5	45.8	55.3	46.2	
Total	100.0	100.0	100.0	100.0	

Dog food					
Commercial diet	92.0	97.2	89.5	88.5	0.156 ^b (0.072)
Home cooked diet	4.5	2.8	3.9	7.7	
Other	3.5	0.0	6.6	3.8	
Total	100.0	100.0	100.0	100.0	
Quantity of food					
as it wants	7.0	5.6	6.6	9.6	0.238 ^b (0.195)
as stated, calculated	44.5	51.4	46.1	32.7	
as estimated	47.5	43.1	44.7	57.7	
do not know	1.0	0.0	2.6	0.0	
Total	100.0	100.0	100.0	100.0	
Dog sexual status					
Male Intact	24.5	30.6	17.3	17.3	0.168
Male Neutered	27.5	20.8	23.7	42.3	
Female Intact	18.0	19.4	19.7	13.5	
Female Neutered	30.0	29.2	32.9	26.9	
Total	100.0	100.0	100.0	100.0	

^a 100.0% were child of owner.

^b Cells have expected count less than 5. Likelihood Ratio given between brackets.

In table 1 we see the descriptive statistics of all the information gathered from the first 2 parts of the questionnaire; general information of the owner and general information of the dog. All values indicating the amount of answers are given in percentages. These demographic values were tested using the Pearson's Chi-squared test on all answers given in parts 1 and 2 of the questionnaire. When too many cells had an expected count of less than 5 the Likelihood Ratio is given between brackets. In total most participants were the owner of the dog (93.5%), female (72%), had a higher educational level (49.7%), were married (46.5%) and fed a commercial diet (92%) in the amounts as stated by a veterinarian or estimated by the owners themselves (44.5% and 47.5% resp.).

Right away a pattern was found in the answers concerning the educational level of the owner and the BCS of the dogs: as education level decreased, the frequency of a BCS5 seemed to increase. In the results in table 1 it is clear that a significance of 0.012 (Likelihood Ratio of 0.008) was found. Seen as the N values greatly differed between groups the question arose whether the significance would still hold when the N-values were more alike. Therefore we split the education levels into two groups (lower education (LE): primary school, VMBO, MAVO or LBO, higher education (HE): MBO, HAVO, VWO, HBO or WO) and plotted these against the BCS (see figure 1) in order to see whether these groups would still show the same trend.

It is clear from both the significances (Pearson's Chi-squared as well as the Likelihood ratio) that there is a relation between the two, seen as the relative frequency of LE significantly increases (doubles) comparing BCS3 to BCS5 and vice versa for the relative frequency of the HE. This indicates that lower educational level of the owners could form a risk-factor for the development of obesity in dogs.

Figure 1. BCS vs relative frequency of education level

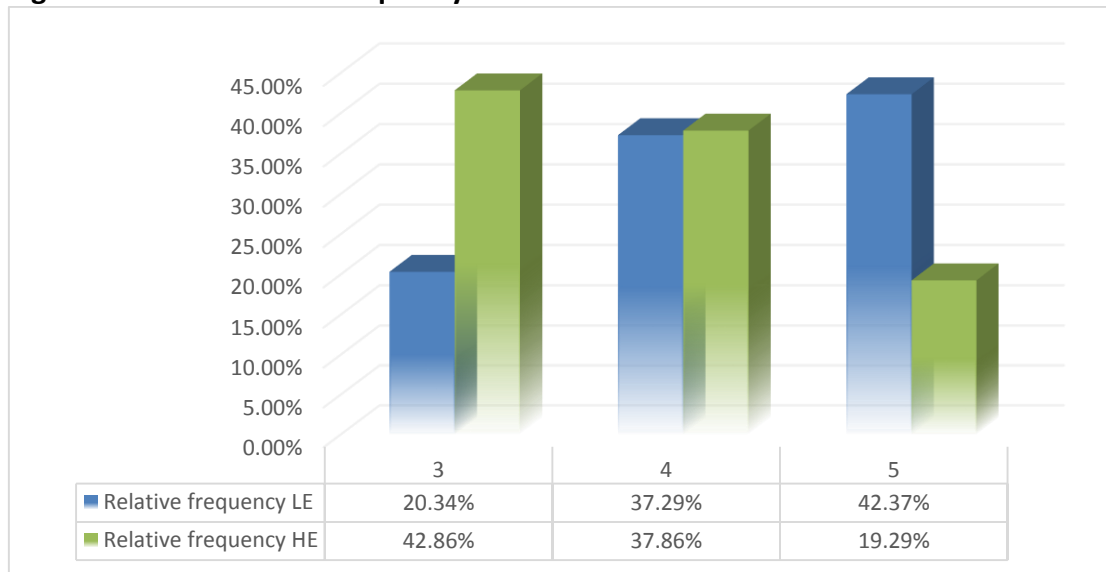


Table 2. Owner demographic, dog information and activities

Variable	Body condition score			min	max	P-value	
	BCS = 3	BCS = 4	BCS = 5				
Owner Age (yr)	44.18 ± 15.18	44.43 ± 13.92	46.00 ± 16.95	19.00	78.00	0.194	
Owning period (yr)	5.22 ± 3.97	5.43 ± 3.70	7.44 ± 2.97	0.17	15.00	0.002	
Dog age (yr)	5.61 ± 4.01	6.11 ± 3.59	8.44 ± 9.29	0.17	15.17	0.000	
Indoor activity (hr/week)	Walk	11.45 ± 12.14	8.75 ± 4.70	9.40 ± 6.12	1.00	56.00	0.668
	Run	4.62 ± 4.06	4.00 ± 2.38	4.17 ± 2.23	0.50	14.00	0.909
	Play	7.30 ± 7.79	5.39 ± 5.00	7.33 ± 9.10	0.25	35.00	0.370
	Other	13.50 ± 7.51	29.00 ± 19.05	-	7.00	40.00	0.190
Outdoor activity (hr/week)	Walk	11.28 ± 6.08	11.88 ± 7.65	17.28 ± 17.19	0.16	70.00	0.006
	InWalk	2.24 ± 0.72	2.28 ± 0.66	2.46 ± 0.90	-1.83	4.25	0.295
	Run	5.21 ± 4.66	5.98 ± 5.02	6.08 ± 4.58	1.00	21.00	0.633
	Play	7.44 ± 10.04	7.74 ± 12.11	4.00 ± 3.57	0.50	50.00	0.292
	Other	7.50 ± 7.91	11.30 ± 8.63	14.00 ± 24.00	0.50	50.00	0.713

Using ANOVA's the mean, minimal, maximal and P-values were calculated for the owner demographic, dog information and activities questions of parts 1 and 2 of the questionnaire. Using boxplots and q-plots we looked at the requirements for using an ANOVA test. Preferably these tests would not be used seen as they are very subjective depending on the person conducting the experiment. Instead, the Kolmogorov-Smirnov one sample tests as well as two-sample tests would provide more accurate answers but these lie outside the scope of this Masterstudy to perform. All variables complied to these requirements, making a Kruskal-Wallis obsolete. For the variable Walking Outdoor the q-plot shows a better trend after a natural-log transformation, which is why these additional values are shown in the table. Before transformation this variable shows a significant value, however after transformation there was no more significance.

Again, significant values are shown in bold. Both Owing period and Dog age showed significance between the different BCS groups. Using the Bonferroni t-test we found that, for both variables, there was a significance between BCS3 & BCS5, as well as between BCS4 & BCS5. No significance was seen between BCS3 & BCS4. This leads to the conclusion that dogs with a BCS5 have on average been kept longer than dogs with a BCS3 or BCS4. The same goes for the dog's age; dogs with a BCS5 are significantly older on average than the dogs with a BCS3 or BCS4. The surprising value seen for walking outdoor for the BCS5 group (17.28 ± 17.19) which we expected to be lower immediately stands out. We expected to see that dogs with a BCS5 would walk less outside than dogs with BCS3 or BCS4 (as mentioned in the introduction, obesity can be the result of too much energy intake or too little exercise). This could mean that either an error has been made in our statistical analysis, or this could indicate that owners exaggerate the amount of walking time outdoors. This would be in line with the statements of various vets we encountered in the Netherlands, telling us that overweight in dogs is a sensitive subject and people don't tend to like admitting to being the reason their dogs are obese. However, to be sure, all the filled in questionnaires should be checked and the statistical analysis should be re-done.

Table 3. Owner's rating concerning the QoL comparing between BCS

Variable	Body condition score			P-value between BCS ^a	
	BCS = 3	BCS = 4	BCS = 5		
Physical dimension	GS	-4.31 ± 0.69	-3.76 ± 1.12	-3.76 ± 0.88	0.028 0.075 1.000
	I	-1.98 ± 1.12	-1.54 ± 1.39	-0.11 ± 2.08	0.581 0.000 0.001
	EI	-4.13 ± 1.43	-3.41 ± 2.20	-2.52 ± 3.45	0.538 0.029 0.408
Psychological dimension	AWOL	-3.81 ± 1.53	-3.44 ± 1.68	-2.43 ± 2.24	1.000 0.011 0.081
	GA	-3.27 ± 2.22	-3.08 ± 2.27	-3.10 ± 2.23	1.000 1.000 1.000
Social dimension	DFAS	2.31 ± 1.77	2.53 ± 1.68	1.66 ± 2.27	1.000 0.536 0.201
	S	0.61 ± 2.86	0.12 ± 3.40	-1.84 ± 2.87	1.000 0.009 0.041
Environmental dimension	BN	2.72 ± 1.91	2.84 ± 1.84	2.47 ± 2.52	1.000 1.000 1.000
	SA	2.82 ± 2.41	2.47 ± 2.84	1.91 ± 2.78	1.000 0.573 1.000

a = In this column the 3 numbers in each row correspond to the following order:

1# = comparing between BCS3 & BCS4

2# = comparing between BCS3 & BCS5

3# = comparing between BCS4 & BCS5

Table 4. Rating of the owner's attitude toward feeding & exercise comparing between_BCS

Variable	Body condition score			P-value between BCS ^a	
	BCS = 3	BCS = 4	BCS = 5		
Attitude in Feeding	AOKCF	-0.99 ± 0.77	-0.67 ± 1.21	-0.65 ± 0.77	0.436 0.556 1.000
	FP	-4.01 ± 1.70	-2.91 ± 2.23	-2.14 ± 3.07	0.107 0.006 0.558
	OCEBF	-4.48 ± 0.70	-3.76 ± 1.27	-3.14 ± 1.65	0.029 0.000 0.142
	DCBF	-4.49 ± 0.91	-3.61 ± 1.67	-1.72 ± 3.32	0.160 0.000 0.001
	CBF	3.92 ± 2.23	3.20 ± 2.08	2.69 ± 2.07	0.400 0.082 1.000
	VE	1.82 ± 1.68	1.46 ± 1.44	1.49 ± 1.25	0.883 1.000 1.000
Attitude in Exercise	LKCE	-3.75 ± 1.86	-3.63 ± 1.75	-1.37 ± 3.24	1.000 0.000 0.000
	DCBE	0.45 ± 2.72	-0.78 ± 2.39	-0,47 ± 2.37	0.097 0.478 1.000
	OCBE	-3.91 ± 1.47	-3.70 ± 1.18	-2.21 ± 2.21	1.000 0.000 0.001
	EBE	-4.41 ± 1.15	-4.09 ± 1.51	-4.08 ± 1.34	0.899 1.000 1.000
	CBE	3.49 ± 1.51	3.40 ± 2.10	2.51 ± 2.99	1.000 0.247 0.322

a = In this column the 3 numbers in each row correspond to the following order:

1# = comparing between BCS3 & BSC4

2# = comparing between BCS3 & BSC5

3# = comparing between BCS4 & BCS5

Tables 3 and 4 show the mean and P-values for the different questionnaire-groups that are made up of the different statements of part 3 of the questionnaire. These values were obtained using MANOVA's (multivariate ANOVA's). Again boxplots and q-plots were used to assess whether the dataset met the requirements for the MANOVA's. Using the Bonferroni t-test we found significant values between different BCS groups. All these significant P-values (<0.05) are shown in bold.

Based on these significant values we decided to do the same tests on the specific questions correlating with the significant groups. These results are shown in table 5.

Table 5. Questions of questionnaire groups significant in table 4.

Question	Body condition score			P-value between BCS ^a	
	BCS = 3	BCS = 4	BCS = 5		
GS	Q1	-4.45 ± 1.13	-3.52 ± 2.47	-4.28 ± 1.07	0.069 1.000 0.290
	Q2	-3.34 ± 2.82	-2.90 ± 3.16	-3.62 ± 2.52	1.000 1.000 0.980
	Q3	-4.36 ± 1.41	-3.99 ± 1.96	-4.39 ± 0.67	0.843 1.000 0.920
	Q4	-4.61 ± 1.32	-4.18 ± 1.31	-4.64 ± 0.50	0.320 1.000 0.365
	Q5	-4.44 ± 1.59	-3.87 ± 2.05	-4.40 ± 1.30	0.457 1.000 0.687
	Q6	-4.69 ± 0.48	-3.63 ± 2.15	-2.16 ± 3.55	0.106 0.000 0.106
	Q7	-4.35 ± 1.18	-3.17 ± 2.35	-3.25 ± 2.33	0.032 0.112 1.000
	Q8	-3.93 ± 2.47	-4.19 ± 1.28	-4.51 ± 0.64	1.000 0.588 1.000
	Q9	-4.63 ± 0.97	-4.19 ± 1.45	-4.70 ± 0.49	0.257 1.000 0.226
	Q10	-4.31 ± 1.48	-3.93 ± 1.68	-1.68 ± 4.14	1.000 0.000 0.001
I	Q11	2.17 ± 3.11	1.44 ± 3.40	0.06 ± 3.30	0.962 0.043 0.299
	Q12	-3.33 ± 2.39	-2.94 ± 2.72	0.22 ± 3.64	1.000 0.000 0.000
	Q13	-3.86 ± 2.25	-3.05 ± 3.05	-0.58 ± 4.06	0.749 0.000 0.006
	Q14	-4.31 ± 1.63	-3.10 ± 2.71	-0.65 ± 3.73	0.144 0.000 0.001
	Q15	-3.80 ± 2.32	-2.55 ± 3.11	0.07 ± 4.24	0.257 0.000 0.005
	Q16	-2.82 ± 3.14	-1.86 ± 3.03	0.79 ± 4.15	0.616 0.000 0.007
	Q17	-3.88 ± 2.28	-2.67 ± 3.13	-1.38 ± 4.19	0.286 0.009 0.326
	Q18	3.99 ± 1.84	2.43 ± 3.40	0.58 ± 3.51	0.066 0.000 0.047
EI	Q19	-3.94 ± 2.09	-3.19 ± 2.68	-2.28 ± 3.49	0.678 0.061 0.563
	Q20	-4.31 ± 2.00	-3.63 ± 2.44	-2.75 ± 3.65	0.756

					0.074
					0.581
AWOL	Q21	-3.77 ± 2.24	-3.56 ± 1.81	-2.81 ± 3.39	1.000 0.381 0.663
	Q22	-3.40 ± 2.91	-2.76 ± 3.45	-0.97 ± 3.57	1.000 0.016 0.101
	Q23	-4.25 ± 1.46	-4.00 ± 1.89	-3.52 ± 2.00	1.000 0.342 0.856
S	Q31	0.93 ± 3.27	0.65 ± 3.61	-1.84 ± 2.76	1.000 0.005 0.011
	Q32	0.29 ± 3.69	-0.40 ± 3.68	-1.83 ± 3.42	1.000 0.077 0.361
FP	Q42	-3.98 ± 2.30	-2.74 ± 2.99	-2.34 ± 3.05	0.153 0.076 1.000
	Q43	-3.86 ± 2.25	-2.72 ± 2.89	-2.34 ± 3.12	0.204 0.106 1.000
	Q44	-4.21 ± 1.65	-3.27 ± 2.57	-1.72 ± 3.58	0.334 0.001 0.058
	Q45	-4.34 ± 1.28	-2.96 ± 2.45	-0.46 ± 2.93	0.022 0.000 0.000
OCEBF	Q46	-4.36 ± 1.35	-4.30 ± 1.50	-4.26 ± 1.63	1.000 1.000 1.000
	Q47	-4.55 ± 1.15	-4.13 ± 1.86	-3.73 ± 2.34	0.878 0.234 1.000
	Q48	-4.68 ± 0.54	-3.65 ± 2.57	-4.12 ± 1.43	0.042 0.724 0.920
	Q49	-4.56 ± 0.78	-3.14 ± 2.55	-1.77 ± 3.79	0.039 0.000 0.100
DCBF	Q50	-4.64 ± 0.90	-3.78 ± 2.16	-1.21 ± 3.54	0.286 0.000 0.000
	Q51	-4.27 ± 1.75	-3.90 ± 2.31	-2.17 ± 3.48	1.000 0.004 0.020
LKCE	Q60	-3.92 ± 2.15	-4.13 ± 1.36	-1.67 ± 3.59	1.000 0.001 0.000
	Q61	-3.51 ± 2.44	-3.15 ± 2.63	-1.48 ± 3.21	1.000 0.014 0.049
	Q62	-3.81 ± 2.02	-3.60 ± 2.34	-0.95 ± 3.48	1.000 0.000 0.000
OCBE	Q66	-3.95 ± 2.02	-3.80 ± 1.93	-1.75 ± 3.51	1.000 0.002 0.004
	Q67	-4.15 ± 1.32	-3.90 ± 1.74	-2.17 ± 3.57	1.000 0.002 0.007

				1.000
Q68	-4.32 ± 1.23	-3.91 ± 1.60	-1.78 ± 3.55	0.000
				0.000
Q69	-3.94 ± 2.07	-3.84 ± 1.74	-1.40 ± 3.67	1.000
				0.000
Q70	-3.86 ± 2.27	-3.71 ± 1.94	-3.42 ± 2.03	1.000
				1.000
Q71	-3.43 ± 2.27	-3.27 ± 2.24	-1.38 ± 3.08	1.000
				0.006
				0.010
Q72	-3.68 ± 2.49	-3.45 ± 2.53	-3.59 ± 2.15	1.000
				1.000
				1.000

a = In this column the 3 numbers in each row correspond to the following order:

1# = comparing between BCS3 & BCS4

2# = comparing between BCS3 & BCS5

3# = comparing between BCS4 & BCS5

Using the same tests as in table 4 we tested each individual question comprising the various groups noted as significant in the previous table. Significant values are given in bold. When combining tables 3, 4 and 5 the following results and conclusions become visible.

In GS we see that there is a significance between BCS3 and BCS4 indicating that dogs with a BCS3 are generally less sick (or show less symptoms of sickness) than dogs with a BCS4. The significance shows specifically in questions 6, 7 and 10 indicating that if the dogs show any symptoms it concerns mainly difficulty when breathing, mood changes and less interest in other dogs or people. On average the same number was scored for both BCS4 and BCS5 but according to the data for BCS5 there was no significance.

For I the significance indicates that dogs with a BCS3 have less problems with immobility than dogs with a BCS5, as well as BCS4 compared to BCS5 (this goes for all aspects of the immobility-section of the questionnaire; questions 11-18 all showed significance). These dogs with the BCS3 also showed less external irritation than the dogs with a BCS5. Whether these findings are a result of the obesity present or if the obesity is a result of these is unknown.

Concerning behaviour, dogs with a BCS3 showed to be less anxious when the owner would leave than dogs with a BCS5 (the significance was seen specifically in crying when the owner leaves; question 22). In accordance with this these dogs also appear to be less sociable than their lighter counterparts. Looking at the sociability questions specifically, the significance appears in question 31 regarding whether the dog plays with other dogs often.

When looking at the feeding-related questions (37-54) we see that the owners find it more important to feed the dogs that scored a BCS5 whenever the dogs indicated they wanted food. Also it was clear that dogs with a BCS5 were more exposed to the wrong type of food than BCS3 dogs, either because it was their feeding regime, because other people were responsible for feeding them, because owners complied to the dogs' wishes for food with lower quality or because the better food is too expensive.

Regarding exercise owners described less lack of knowledge for BCS3 or BCS4 when compared to BCS5 when it comes down to the frequency, length and type of exercise their dogs needed. With BCS3 dogs there was less trouble with owner-centered barriers of exercise, like owners who don't like exercise (type and/or length) or who are physically incapable of providing said exercise.

Discussion

Gathering enough data using the questionnaire resulted in difficulties right away. As discussed in the Materials & Method a lot of clinics initially responded positively when asked to participate. However, when gathering all questionnaires the response disappointed especially after exemption criteria were applied. We ended up handing out questionnaires and approaching owners personally which contradicted to the approach used by S. Soontarak. The question arose amongst different veterinarians whether owners would answer each question seriously despite the questionnaire being so long. It took at least 10 minutes for most owners to fill out the entire form, which most vets deemed too long. This resulted in us having to reach out to owners throughout the whole country instead of owners in just one province/region. Furthermore a lot of feedback was obtained from owners as well as veterinarians concerning the scale used to assess the owner's view on the statements. Most remarks concerned applicability rather than the validity, and mainly owners found it to be a very unclear method making it hard to translate their opinions on the matters rather than using categorical values. Using the scale also meant that the questionnaires had to be filled in on paper rather than digitally, making it a lot harder to reach as many owners as possible. Furthermore, different professionals admitted that when overweight and obesity is involved, owners tend to find it a very sensitive subject. Many veterinarians found from their experience that owners tend to lie when it comes to their role in the pet's health when it was clear that they were either overweight or even morbidly obese. Furthermore the entire questionnaire was based on the ability of owners to perform a reliable self-reflection as all answers given concerned the owners themselves and their dogs.

Contrary to the initial belief of most participating veterinarians, it was proven most difficult to obtain a high enough number of filled-in questionnaires concerning dogs with a BCS5. For both BCS3 and BCS4 enough questionnaires were obtained after applying the data collection methods as described above, however gathering enough questionnaires concerning dogs with a BCS5 took a significantly longer time, more veterinary clinics and more trimming salons. As explained in the materials and method we had to divert from our original plan to collect data solely from veterinary clinics in order to meet the required amount of questionnaires. This meant we had to spread out resources and ask veterinary assistants and students to help identifying the BCS of the dogs participating in the study. This meant that an increasingly amount of questionnaires was obtained, however this did result in a loss in accuracy where the identification of the BCS of the dogs was concerned. Preferably we would have seen that one person identified the BCS for every questionnaire in order to make this part of the questionnaire less subject to personal differences between people.

Regarding the questionnaire itself it should be noted that the part focussed on the QoL originates from a study focussed on sick dogs in general, not specifically overweight or obesity. Therefore careful consideration should be taken when examining the results in this aspect. Also the QoL should be further investigated using an adapted questionnaire further specified for dogs with overweight or obesity in order to get more specific data for the question at hand.

The statistical analysis of this paper proved to be very difficult for the current researcher. As mentioned in the results, for at least one test (Q-plot) a different test would have been preferred. This Kolmogorov-Smirnov one sample test has not been executed. A thorough re-do of the statistics would benefit the paper as well as the subject matter and even possibly give a larger amount of information to work on. Orthogonal factor loadings as well as the correlations could further add to the comparison seen as Soontararak included these tests as part of her MSc thesis. However, these tests lie outside of the scope of a Master Research paper and as such, regrettably, have been excluded from this research.

When we compare our outcomes with those of Soontararak, we can see that in the owner demographics a lot of aspects compare. Most participants in both studies were owner of the dog, female with a high educational level. Furthermore in both studies commercial food was given to the dogs in the amounts as estimated by the owners themselves. The conclusion that Soontararak was able to make were not all the same as ours. For example she was able to determine a relationship between the BCS and amount of food given, whilst we only saw a significance where it regarded the educational level when plotted against the BCS.

One third of all dogs were female neutered dogs (30%) followed by male neutered (27.5%), male intact (24.5) and finally female intact (18%). In our study there appeared no significance indicating no exceptional deviation in the data whereas Soontararak found that amongst the female group there was a higher BCS related with the intact status and an ideal weight related to the neutered status.

Just like Soontararak we found that as BCS increased, the dogs were more subject to general sickness than dogs with an ideal weight. Also, dogs with higher BCS's had significantly more trouble with immobility when compared with dogs with an ideal weight. This could all lead to imply that overweight and obesity potentially affected the health status of the dogs and therefore the QoL. This all compares to the conclusions drawn in Thailand. However, dogs with a BCS3 (ideal weight) showed to be less anxious than obese dogs, especially when it regarded crying when the owner leaves. Whether this is the result of pampering by the owner by means of treats and/or more food given to the dog leading to the anxiety should be further investigated. Furthermore the crying could be the result of conditioning on the dog's part where crying in previous settings resulted in attention and/or treats.

Also in accordance with Soontararak's results we found that the owners of dogs with ideal weight stated to have more control over the feeding regime of the dogs when compared to the dogs with obesity (BCS5). Owners in the Netherlands implied this to be the result of other people being involved in the feeding of the dog or the use of wrong types of food. Regarding exercise it is also clear that owners of dogs with an ideal weight experiences less owner-centered barriers relating to the overweight or obese dogs. This includes owner-convenience as well as owner-incapability to provide adequate exercise to the dogs, as well as in Thailand.

When combining all the findings in the QoI part as well as the owner-attitude part of the questionnaire it is clear that as weight increases (BCS increases) the dogs experience more trouble concerning especially the general sickness and immobility impairing and thereby lowering their QoI. Also the owner-centered barriers for feeding (wrong type of food, other people responsible for feeding) as well as exercise (convenience to, as well as incapability of, the owner) showed to be significantly related to the BCS, which in turn affects the QoI of the dog (either directly or indirectly by leading to general sickness and immobility problems). This corresponds with the study of Soontararak where she also lead to conclude that the QoI was impaired, based on the fact that the physical status of the dogs with increasing BCS's lowered the QoI.

Conclusion

Many significances were found using the questionnaire spread over many different aspects (groups) of the dog's life and the owner's role in it. The results revealed that especially the physical, psychological and social dimensions were afflicted in overweight dogs in the Netherlands, together with the owner's attitude in feeding the dogs. Also the educational level of the owners showed a relationship with the BCS in the participating dogs. These questionnaires indicate different possible risk-factors for the development of obesity that could even be used as a basis for the development of prevention plans regarding the onset of obesity nationwide. However, these should be put to the test to see whether these significances hold when N increases, preferably following different dogs throughout their entire life starting as a pup when exposed to these different factors.

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Appendix 1. The questionnaire

Geachte meneer/mevrouw,

Aan de Universiteit Utrecht, bij de faculteit Diergeneeskunde, wordt onderzoek gedaan naar de relatie tussen overgewicht en het welzijn van honden. Overgewicht bij huisdieren is een probleem wat men steeds vaker bij mens en dier ziet. Daarom is het doen van dit onderzoek van groot belang.

Graag zou ik voor dit onderzoek uw medewerking willen vragen. Bij deze brief is een enquête toegevoegd waarvan het invullen slechts 10 minuten van uw tijd zal innemen. Enkele vragen zijn ook op u als eigenaar/verzorger van het dier gericht. Dit komt omdat we de resultaten van dit onderzoek graag willen vergelijken met resultaten uit andere landen, zoals Thailand. De instelling van de eigenaar/verzorgen speelt hierbij een grote rol en daarom zou ik het erg op prijs stellen als u mij hiermee zou willen helpen. De enquête is anoniem; ik zal met alle gegevens zeer zorgvuldig omgaan.

Mocht u vragen hebben of de resultaten van dit onderzoek in willen zien, dan kunt u mij bereiken op onderzoek.OvergewichtEnWelzijn@gmail.com.

Met vriendelijke groeten,

Liselot Smulders
Onderzoeker



Universiteit Utrecht

In te vullen door het personeel:

Body condition score: 3/5 4/5 5/5

Deel 1: Algemene informatie over de eigenaar/verzorgder:

1. Wat is uw geslacht? Man Vrouw
2. Wat is uw leeftijd? _____ Jaar
3. Wat is uw hoogst genoten opleiding? Basis onderwijs
 VMBO/ MAVO/ LBO
 MBO
 HAVO/VWO
 HBO/ WO
4. Wat is uw relatie met de hond? Eigenaar Anders, namelijk _____
5. Hoe lang heeft u deze relatie al? _____ jaar en _____ maanden
6. Wat is uw burgerlijke staat? Gehuwd Ongehuwd Samenwonend
 Gescheiden Weduwschap
7. Heeft u kinderen? Ja Nee (Ga verder bij vraag 9)
8. Wat is het aantal en de leeftijd van uw kinderen?

Ik heb _____ (aantal) kinderen, met de leeftijd(en) van _____ jaar oud.

Deel 2: Algemene informatie over de hond:

9. Wat is het geslacht van uw hond? Mannelijk Vrouwelijk
10. Hoe oud is de hond? _____ Jaar en _____ maanden
11. Is uw hond gecastreerd/gesteriliseerd? Ja Nee
12. Wat is het ras van uw hond? Rashond, namelijk: _____
_____ Kruising tussen: _____ en _____

 Weet niet
13. Wat voor soort voeding krijgt de hond?
 Commercieel verkrijgbaar van het merk: _____
 Zelfgemaakt voer met daarin: _____

14. Hoeveel voer krijgt de hond?
 Zo veel als hij/zij wil, de voerbak is altijd vol
 Zo veel als er aangegeven is door de dierenarts, of wordt aangegeven op de verpakking
 Zo veel als ik denk dat hij nodig heeft
 Ik ben me hier niet van bewust

15. Hoeveel voer eet de hond?

- Alles dat in zijn voerbak ligt, en vaak nog wat extra, zoals etensrestjes.
- Alleen het voer wat in zijn voerbak ligt
 - Vaak eet de hond niet alles op wat in zijn voerbak ligt

16. Hoeveel beweging krijgt de hond gemiddeld (graag invullen in uren per week)?

	Uren per week: Binnenshuis	Uren per week: Buitenshuis
Spelend		
Wandelend		
Rennend		
Anders		

Deel 3: vragen over gedrag en welzijn hond:

Instructie: Geef alstublieft aan in hoeverre u het met de volgende stellingen eens bent door een streepje (/) door de horizontale lijn te trekken:

Zet een streepje door de horizontale lijn om uw mening aan te geven.

		HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
		Mijn hond...		
1	... gedraagt zich ziek.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
2	... vindt het niet fijn om aangeraakt te worden.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
3	... heeft moeite met poepen en/of plassen of doet dit vaker dan anders.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
4	... heeft moeite met slapen.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
5	... is in de loop van de tijd vaker gaan braken.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
6	... heeft moeite met ademen.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
7	... is merkbaar van stemming/humeur veranderd.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
8	... is agressief geworden tegenover honden en/of mensen die hij/zij eerst accepteerde.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS
9	... raakt vaker de weg kwijt op plekken die bekend waren/zouden moeten zijn.	HELEMAAL NIET MEE EENS	NEUTRAAL	HELEMAAL MEE EENS

10	... vertoont minder interesse in andere honden of mensen dan voorheen.	
11	... heeft veel energie.	
12	... wordt zelden nog opgewonden.	
13	... heeft moeite met opstaan als hij/zij gelegen heeft.	
14	... heeft moeite met lopen.	
15	... heeft moeite met traplopen. ○ N.v.t.	
16	... speelt minder fanatiek dan voorheen.	
17	... heeft moeite om in en uit de auto te komen. ○ N.v.t.	
18	... kan over het algemeen goed bewegen.	
19	... bijt of krabt op sommige plekken aan zijn lichaam tot het daar rood/geïrriteerd is.	
20	... is op sommige plekken kaal.	
21	... kauwt op dingen waarvan hij/zij geleerd heeft niet op te kauwen.	
22	... jankt als ik wegga.	
23	... maakt een rotzooi als ik weg ben.	
24	... schrikt snel(ler dan voorheen).	
25	... is bang als hij/zij een nieuwe persoon of hond ontmoet.	
26	... zit met de staart tussen de achterpoten wanneer hij/zij op een	










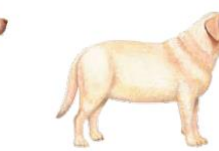
	nieuwe/onbekende plek komt.	
27	... krijgt speeltijd als hij/zij aangeeft dit te willen.	
28	... wordt vaak geaaid door mij.	
29	... wordt vaak verzorgd (bv. geborsteld).	
30	... is altijd bij mij als ik vrije tijd heb.	
31	... speelt vaak met andere honden.	
32	... deelt zijn speeltjes met andere honden.	
33	... heeft de hele dag vers drinkwater.	
34	... kan naar buiten als hij/zij naar buiten wil.	
35	... heeft een eigen slaapplek.	
36	... heeft een eigen slaapruiimte.	
Overige stellingen over voeding en beweging:		
37	Ik weet niet hoeveel ik mijn hond moet voeren.	
38	Ik weet niet wat voor soort voer ik mijn hond moet geven.	
39	Ik weet niet hoe vaak per dag ik mijn hond moet voeren.	
40	Ik vind het belangrijk dat ik mijn hond het juiste soort voer geef.	
41	Ik vind het belangrijk dat mijn hond een juist aantal keer per dag gevoerd wordt.	
42	Ik vind het belangrijk dat ik mijn hond voer geef (elke keer) wanneer hij/zij dat wil/aangeeft te willen.	

43	Ik vind het belangrijk dat mijn hond kan eten wat hij/zij aangeeft te willen eten.	
44	Ik vind het belangrijk dat ik mijn hond zoveel eten geef als hij/zij wil.	
45	Mijn hond is te dik omdat hij/zij altijd eten wil.	
46	Mijn hond krijgt niet het juiste soort voer omdat andere mensen (ook) mijn hond voeren.	
47	Ik geef mijn hond niet het goede soort eten omdat hij/zij ander voer lekkerder vindt.	
48	Mijn hond krijgt niet het juiste aantal keren per dag te eten omdat andere mensen mijn hond (ook) voeren.	
49	Ik geef mijn hond een verkeerd soort voer omdat ik het leuk vind mijn hond te verwennen.	
50	Mijn hond is te dik omdat ik hem/haar laat eten wanneer hij/zij dat wil.	
51	Ik geef mijn hond niet het juiste soort voer omdat het andere voer te duur is.	
52	Hoeveel controle heeft u over de hoeveelheid voer die u geeft aan uw hond?	
53	Hoeveel controle heeft u over het soort voer dat u geeft aan uw hond?	
54	Hoeveel controle heeft u over het aantal keer per dag dat u uw hond voert?	
55	Ik vind het belangrijk dat ik mijn hond een gepast aantal keer per week beweging geef.	
56	Ik vind het belangrijk dat mijn hond een gepaste vorm van beweging krijgt.	

57	Ik vind het belangrijk dat mijn hond fit is.	
58	Mijn hond heeft geen beweging nodig.	
59	Ik vind het belangrijk dat mijn hond een gepaste tijdsduur krijgt per keer dat ik hem beweging geef.	
60	Ik weet niet hoe vaak ik mijn hond beweging moet geven.	
61	Ik weet niet hoe lang mijn hond per dag beweging moet krijgen.	
62	Ik weet niet wat een goede vorm van beweging is voor mijn hond.	
63	Ik vind het belangrijk dat mijn hond altijd beweging krijgt als hij dat wil.	
64	Ik vind het belangrijk dat mijn hond zo lang beweging krijgt als hij dat wil.	
65	Ik vind het belangrijk dat mijn hond het soort beweging krijg als hij zelf wil.	
66	Ik geef mijn hond niet vaak genoeg beweging, omdat ik daar niet van hou.	
67	Ik geef mijn hond per keer niet lang genoeg beweging, omdat ik daar niet van hou.	
68	Ik geef mijn hond niet de juiste bewegingsvorm omdat ik dat niet kan/wil.	
69	Ik geef mijn hond niet de juiste soort beweging omdat mijn hond dat niet kan/wil.	
70	Doordat hij/zij slecht gedrag vertoont, krijgt mijn hond minder vaak beweging.	
71	Wegens tijdsgebrek geef ik mijn hond niet voldoende beweging.	

72	Wegens een ongeschikte omgeving krijgt mijn hond niet de juiste soort beweging.	
73	Mijn hond krijgt onvoldoende lang beweging omdat anderen hiervoor verantwoordelijk zijn.	
74	Mijn hond krijgt niet de juiste soort beweging omdat anderen hiervoor verantwoordelijk zijn.	
75	Mijn hond krijgt onvoldoende vaak beweging omdat anderen hiervoor verantwoordelijk zijn.	
76	Hoeveel controle heeft u over het soort beweging dat uw hond krijgt?	
77	Hoeveel controle heeft u over hoe vaak uw hond beweging krijgt?	
78	Hoeveel controle heeft u over de duur van beweging die uw hond krijgt?	

Appendix 2. BCS chart

BODY 1 SCORE	BODY 2 SCORE	BODY 3 SCORE	BODY 4 SCORE	BODY 5 SCORE
<p>VERY THIN < 5% body fat</p> <p>Ribs – Easily felt with no fat cover Tail Base – Bones are raised, no fat cover Side View – Severe abdominal tuck Overhead View – Accentuated hourglass shape</p> <p>20% below ideal body weight</p>	<p>UNDERWEIGHT 5-15% body fat</p> <p>Ribs – Easily felt with little fat cover Tail Base – Bones are raised with slight fat cover Side View – Abdominal tuck Overhead View – Marked hourglass shape</p> <p>10% below ideal body weight</p>	<p>IDEAL BODY WEIGHT 16-25% body fat</p> <p>Ribs – Easily felt with slight fat cover Tail Base – Some contour with slight fat cover Side View – Abdominal tuck Overhead View – Well-proportioned waist</p> <p>Ideal body weight</p>	<p>OVERWEIGHT 26-35% body fat</p> <p>Ribs – Difficult to feel under moderate fat cover Tail Base – Some thickening, bones palpable under moderate fat cover Side View – No abdominal tuck Overhead View – Back is slightly broadened at waist</p> <p>10% above ideal body weight</p>	<p>OBESE > 35% body fat</p> <p>Ribs – Difficult to feel under thick fat cover Tail Base – Thickened and difficult to feel under thick fat cover Side View – No waist, fat hangs from abdomen Overhead View – Back is markedly broadened.</p> <p>20% above ideal body weight</p>
				
				
Consult your veterinarian!	Consult your veterinarian to see if you are underfeeding your dog.	Great job! Keep doing what you are doing.	Consult your veterinarian about the right nutrition for your dog and about ways to increase activity.	Extra weight can cause serious health problems for your dog. Consult your veterinarian about the right nutrition for your dog.

<http://lasvegaspetsweightloss.com/hills-metabolic-diet-program/>