

BODY CONDITION SCORE IN LARGE PURE BRED DOGS: A PRELIMINARY STUDY ON AGREEMENT BETWEEN OWNER'S PERCEPTION AND SCIENTIFIC EVALUATION

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SUMMARY: Obesity is a severe health issue among companion dogs. It may seriously impair the quality of a dog's life predisposing to many other disease conditions. Incorrect assessment of the body condition (BC) of their pets by the dog owners has been identified as an obstacle which would prevent early intervention in canine obesity. This study was designed to assess the degree of agreement between the dog owner's perception of their pet's BC and the scientific assessment of body condition score (BCS). Eighty-two large pure bred dogs were included in the study. Scientific evaluation was performed using 1-5 BCS system proposed by Royal Canin™ (1-emaciated, 2- thin, 3-ideal, 4-over weight, 5- obese). Following the scientific evaluation the owners were asked to assess their pet's BC using a grading system which included appropriate lay terms to describe the 1-5 scoring positions in the scientific method (1=very thin, 2=thin, 3=ideal, 4=fat, 5=very fat). In addition the knowledge of necessity of feeding adjustments and exercise, health risk of obesity and awareness of scientific BC evaluation methods were evaluated using a short questionnaire. Agreement between the owner's perception and scientific method was analyzed using Fleiss' kappa test. Misperception occurred among 31.71% (26/82) of the owners and there was only a fair agreement ($K=0.374321$, $P<0.05$) between two evaluation methods. Interestingly owner misperception about the body condition existed not only in the BCS=4/ Overweight and BCS=5/ Obese groups but also in BCS=2 / Thin group as well. Despite the good knowledge on health risk of obesity and need of exercise among the owners, under estimation was common in BCS=4/ Overweight (40%, 8/20) and BCS =5/ Obese (100%, 5/5) groups which might be a sequela to owner's misperception. In the BCS=2/ Thin group there was a prominent overestimation 3/5 (60%). Only 12.1% of the owners were aware of existence of scientific body condition evaluation methods. Current findings are suggestive of the importance of modifying the owner's perception about their pet's body condition and the necessity of the adequate veterinary intervention through client communication about pet feeding and exercising.

INTRODUCTION

The prevalence of obesity in dogs has increased in recent years (Olsen, 2011). Estimation about the incidence of obesity in various part of the world in dogs reveals that 18%-44% of the population is obese (Anderson, 1973; Edney & Smith, 1986; Kronfeld *et al.*, 1991; Lund *et al.*, 1999; Mason, 1970; Robertson, 2003; Sonnenschein *et al.*, 1991). Excessive deposition of adipose tissue sequal to positive energy balance is the cause of obesity (Colliard *et al.*, 2006; German, 2006; German *et al.*, 2007; Gossellin *et al.*, 2007; Laflamme, 2006; McGreevy *et al.*, 2005). Predisposing factors of obesity include genetics, increased daily energy intake, reduced physical activity level, certain medications (e.g. glucocorticoids) and diseases (e.g. hypothyroidism) (Czirják & Chereji, 2008; German, 2006). Neutering/ spaying also suggested to be a predisposing factor due to the effect of reduced energy requirement (Fettman *et al.*, 1997; Flynn *et al.*, 1996; Jeusette *et al.*, 2006; Jeusette *et al.*, 2004; Root *et al.*, 1996). It could deteriorate the quality of life in dogs as well shorten the life span by predisposing to conditions such as cardiorespiratory diseases (Ettinger & Feldman, 1995), osteoarthritis (Impellizeri *et al.*, 2000), chronic

inflammation, diabetes mellitus (Ettinger & Feldman, 1995), and neoplasia (German, 2006; Lund *et al.*, 1999).

There are various scientific methods used to assess the body condition of dogs (German, 2006; Mawby *et al.*, 2004). They are classified into two different categories as research techniques and clinical techniques. Research techniques include chemical analysis (D2O), densitometry, Dual Energy X-Ray Absorptiometry (DEXA), ultrasound and electrical impedance. Clinical techniques include measuring body weight and morphometric methods (BMI: Body Mass Index, BCS: Body Condition scoring) (German, 2006; Laflamme, 1997a; Mawby *et al.*, 2004). Clinical methods are comparatively quick, inexpensive and non- invasive (German, 2006). BCS is one of the common reliable clinical method (German *et al.*, 2007). Four different types of scales are in use [5 scale and 6 scale (German, 2006), 7 scale and 9 scale (Laflamme, 1997b; 1997a)]. Body condition is determined using visual assessment and palpation which has a correlation with the degree of subcutaneous fat deposition, abdominal fat and condition of superficial muscles (German, 2006). Despite the existence of many methods, the owner's perception about the body condition of their canine companion plays a

significant role to maintain an ideal BC. Some studies conducted in UK revealed that under estimation of BC in pet dogs is quite common among the dog owners (Courcier *et al.*, 2009; Eastland-Jones *et al.*, 2014). Research to investigate the causes of misperception is important to maintain a healthy and ideal dog. In Sri Lanka there are no published studies on this topic. The objective of this study was to assess whether there is any significant difference between the owner's estimation and the scientific BC evaluation (1-5 scale system, Royal Canin™). In addition the knowledge and attitudes on feeding practices, necessity of exercise, awareness of health risks of obesity and awareness of scientific body condition evaluation methods were also assessed.

MATERIAL AND METHODS

The survey was carried out in the Veterinary Teaching Hospital, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya and in a Private Veterinary Practice in Colombo over a period of one month. Owner's consent was obtained prior to the assessment. Inclusion criteria for the study were, large purebred dogs older than 6 months (after sexual maturity) displaying breed characteristics specified for the relevant breed (Fogle, 2002) and (RSPCA 2012). The dog owners were requested to assess the body condition of their dog according to the provided guidelines. First the owners were requested to select an appropriate term out of the five lay terms provided which they think suitable for their pets. The used terms (very thin, thin, ideal, fat, very fat) represented the 1–5 scoring positions in Royal Canin™ BCS system respectively. Following the assessment attitudes on necessity on diet modifications for overweight/ obese dogs (Q2 in Table 4), necessity of exercise to prevent obesity in dogs (Q3 in Table 4), overfeeding in purebred dogs (Q4 in Table 4), awareness of health risk of obesity (Q5 in Table 4) and knowledge about scientific body condition evaluation methods other than body weight (Q6 in Table 4) were assessed using a short questionnaire. Scientific body condition evaluation was performed by a veterinarian using the five scale (1-5) scoring system provided by Royal Canin™ (Table 1). A score was determined for each dog using visual cues followed by palpation [1=emaciated (very thin), 2=thin, 3=ideal, 4=over weight (fat) 5=obese (very fat). In short haired dogs both the visual assessment and palpation helped to determine the fat deposition around the ribs, vertebral column, abdominal tuck and waist. In long haired dogs the determination of BCS heavily relied on palpation that was done to ensure the fat deposition around ribs, vertebral column, abdominal tuck and waist to correctly determine their true body condition. The information on gender and body weight were collected for the purpose of record keeping. The level

Table 1: Royal Canin™ 1-5 body condition scoring system

BCS Assessment criteria	
1	Ribs, spine, pelvic bones easily visible Obvious loss of muscle mass No palpable fat on rib cage
2	Ribs, top of vertebrae, pelvic bones visible Obvious abdominal tuck (waist) No palpable fat on rib cage
3	Ribs, spine, pelvic bones not visible but easily palpable Obvious abdominal tuck
4	Ribs, spine, pelvic bones palpable with difficulty Abdominal tuck absent Fat deposits obvious on spine base of tail
5	Massive fat deposits on thorax, spine and base of tail Obvious abdominal distention

Table 2: Statistical Analysis

Kappa value	Interpretation
<0	Poor agreement
0.01 0.20	Slight agreement
0.21 0.40	Fair agreement
0.41 0.60	Moderate agreement
0.61 0.80	Substantial agreement
0.81 1.00	Almost perfect agreement

Fleiss' Kappa test interpretation

of agreement between two assessments was interpreted according to the calculated kappa value (Fleiss' Kappa test) using Minitab® 17 software (Table 2). To analyze the overall agreement, a kappa value was calculated for the whole group using the two sets of ratings produced by two assessment methods. Agreement within the groups was assessed using the kappa values calculated for each BCS group.

RESULTS AND DISCUSSION

A total number of 82 dogs were evaluated. Dog breeds included were Labrador retriever, German shepherd, Golden retrievers, Rottweiler, Doberman, Great Dane, Rhodesian Ridgeback, Boxer, Bullmastiff, Alaskan Malamute and Hungarian pointer. Most frequent dog breeds were Labrador retriever (34%, n=28) and German shepherd (23%, n=19).

Overall Kappa score of 0.37 ($p < 0.05$, 95% CI) (Landis & Koch, 1977) indicated an overall fair agreement between owner's assessment and scientific BCS evaluation. Owner's assessments did not aligned with the scientific assessment in 31.7% dogs (26/82).

For further detailed analysis, dogs were divided in to five groups based on the body condition score obtained from the scientific method (Group 1/BCS-1, Group 2/BCS-2, Group 3/BCS-3, Group 4/BCS-4 and Group 5/BCS-5). As there were no dogs in the Group 1/BCS 1 the particular group was not

Table 3: Overestimation, correct estimation and underestimation by the pet owners within different groups compared to the scientific evaluation

Group	Overestimated	Correct	Underestimated
Group 2/ BCS 2(n=5)	n=3(60%)	n=2(40%)	-
Group 3/ BCS 3 (n=52)	n=6(11.5%)	n=43(82.7%)	n=3(5.8%)
Group 4/ BCS 4 (n=20)	n=1(5%)	n=11(55%)	n=8(40%)
Group 5/ BCS 5 (n=5)	n=0 (0%)	n=0 (0%)	n=5 (100%)

These results are formulated from the answer to the question 1 in the provided questionnaire. There were no candidates in the Group 1/BCS 1

considered for further analysis. The agreement between two assessments within individual groups was also determined using the same statistical method (Fleiss's kappa test).

Group 2/BCS=2 (n=5) had a kappa score of 0.36 (95% CI, $p < 0.05$) indicating a fair agreement between the two raters. Even though there was a fair agreement between two assessments, a considerable degree (60%, Table. 3) of overestimation existed. However due to the small sample size it is difficult to attempt to a conclusion that this is a significant finding. In this group only 20% of the owners (1/5, Table 4) believed that feed modifications are useful. However the owner's awareness about necessity of exercise and health risk of obesity were satisfactory (Table 4). Sixty percent (60%, Table 4) of the owners in this group did not practice excessive feeding in purebred dogs. Only 40% (Table 4) of owners were aware about scientific methods of evaluating body condition in dogs.

Group 3/BCS 3 the largest group (n=52) had a kappa score of 0.44 (95% CI, $P < 0.05$) which indicated a moderate agreement between the two assessments. However, in this group also only 13.5% (Table 4) of the owners were aware about scientific evaluation methods for assessment of body condition in dogs. Even though only 13.5% (Table. 4) of the owners were aware about scientific body condition evaluation methods, 90.4% (Table. 4) of them were aware about the health risk of obesity and necessity of exercise (Table. 4). A considerable proportion (40.4%, Table. 4) of owners strictly rejected excess feeding in purebred dogs. This might have played an important role in maintaining an optimum BCS even in the absence of knowledge about a scientific BCS evaluation method. Moreover, the owner's awareness on necessity of exercise and the awareness on the health risk of obesity might have contributed substantially to maintaining these dogs in ideal body condition. However, 34.6% dogs had been overfed in this group which might be due to the lack of knowledge about a scientific evaluation method.

Group 4/BCS 4 (n=20) carried a kappa score of 0.38 (95%CI, $P < 0.05$) which indicated a fair agreement between the two assessments. All dogs in this group were overweight according to the scientific evaluation. Interestingly majority of owners in this group (95%, Table 4) were aware of the health risks of obesity. Moreover

80% (Table 4) of the dog owners accepted that exercise is important. However only 5% (Table. 4) of the dog owners were aware about an existence of scientific body condition evaluation methods other than body weight. Therefore, had they provided with a correct body condition scores assessed following a scientific method, they might have attempted to modify feeding practices and exercise to reduce the risk of being overweight. However, in spite of the awareness of the risk of obesity and necessity of exercise, 40% (Table 4) of the dog owners believed that purebred dogs need excessive feeding and only 35% (Table 4) of the owners accepted the need to modify the feed. Therefore, it is necessary to educate the pet owners that feed requirement in dogs does not depend on the breed but according to the energy expenditure and physiological status of the dog.

Group 5/BCS=5, n=5) had a kappa score of -0.037 (95%CI $p > 0.05$) indicating no agreement between the two methods of assessment. According to the scientific evaluation all the dogs in this group were obese and dietary intervention and exercising is essential as they are already predisposed to various health issues (pressure wounds n = 3, exercise intolerance n = 4, infertility = 1). Interestingly under estimation by the pet owners was 100% (Table. 4) even though all the owners were aware of the health risk of obesity as well as the need for exercise. Sixty percent 60% (Table 4) of the owners were willing to modify feed. Excessive feeding of purebred dogs was practiced by 40% (Table 4) of the owners while 40% (Table 4) of the owners disagreed with that. None of the dog owners in this group were aware of scientific body condition evaluation methods other than body weight (Table 4). Therefore, misperception of the body condition of their pets might be an important contributory factor for obesity in this group. However only 5 dogs were in this study and it is necessary to have a larger group to identify the consistency and significance of these findings.

In the groups 4 and 5 despite the awareness of health risks and necessity of exercise, dogs were overweight/obese. One possible explanation for this is existence of underlying disease conditions such as hypothyroidism, cardiac diseases and arthritis, which may predispose the dogs to obesity or interfere with exercising. However, the investigation of these possible underlying factors is beyond the scope of this study. Neutering also known to

Table 4: Attitudes and knowledge on feeding practices, necessity of exercise, obesity and scientific methods of evaluating body condition in dogs

Group	Q2			Q3			Q4			Q5			Q6		
	Y	N	DK	Y	N	DK	Y	N	DK	Y	N	DK	Y	N	DK
BCS-2 (n=5)	20% (n=1)	60% (n=3)	20% (n=1)	100% (n=5)	0% (n=0)	0% (n=0)	40% (n=2)	60% (n=3)	0% (n=0)	60% (n=3)	40% (n=2)	0% (n=0)	40% (n=2)	40% (n=2)	20% (n=1)
BCS-3 (n=52)	23.1% (n=12)	61.5% (n=32)	15.4% (n=8)	90.4% (n=47)	7.7% (n=4)	1.9% (n=1)	34.6% (n=18)	40.4% (n=21)	25% (n=13)	90.4% (n=47)	7.7% (n=4)	1.9% (n=1)	13.5% (n=7)	69.2% (n=36)	17.3% (n=9)
BCS-4 (n=20)	35% (n=7)	60% (n=12)	5% (n=1)	80% (n=16)	15% (n=3)	5% (n=1)	40% (n=8)	30% (n=6)	30% (n=6)	95% (n=1)	5% (n=1)	0% (n=0)	5% (n=1)	90% (n=18)	5% (n=1)
BCS-5 (n=5)	60% (n=3)	40% (n=2)	0% (n=0)	100% (n=5)	0% (n=0)	0% (n=0)	40% (n=2)	40% (n=2)	20% (n=1)	100% (n=5)	0% (n=0)	0% (n=0)	0% (n=0)	80% (n=4)	20% (n=1)

cause changes in the basal metabolism due to hormonal alterations predisposing dogs to obesity. However, as all the dogs included in Group 4 and 5 are reported to be intact this argument is least valid for these groups.

In a previous study conducted in UK (Courcier, et al. 2009) 44.12% (95%CI: 40.39-47.85), n=300) of owners misperceived the body condition of their dogs. Out of these owners 77% (n=231) of the owners under estimated the body condition of their dogs. Fifty-three percent of overweight dog owners had under estimated their dogs (Courcier, et al. 2009). Our study demonstrated an overall 21.9% underestimation (18/82, Table 2) which is comparatively a low difference. However the underestimation percentage within the Obese/Overweight groups was 52% (13/25, Table 2). Interestingly in our study out of the misperceived owners (n=26), 38.5% (10/26, Table 2) over estimated their dogs which was not observed in the UK study.

CONCLUSIONS

Results of this study reveals that even though some of the pet owners are aware about the health risks of obesity they do not attempt for necessary diet modification and/or exercise due to improper perception of their pet's body condition. Therefore, Current findings indicate the importance of veterinary intervention to assess the body condition using a scientific method (based on standard criteria) in pure bred pet dogs to minimize obesity related health risks.

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