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Possible preventive obesity measures for consideration in Labrador Retrievers *Canis lupus familiaris* according to veterinarian and owner opinions

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Abstract

Canine obesity is a persistent and ever-increasing chronic disease. This research investigated possible new and improved preventive obesity measures specific to the Labrador retriever dog breed. Quantitative analysis of questionnaire responses from 128 Labrador retriever owners and 46 veterinarians was used. Owners were asked to score the body condition of their Labrador retrievers using a series of pictograms ranging from 1-5 to establish body levels. Biological and environmental factors of the dogs were investigated to determine their effects on predisposition to body weight levels. The colour of the Labrador (Chi: $\chi^2 = 10.964$; d.f. = 4; $P<0.027$) and the breed (Chi: $\chi^2 = 11.073$; d.f. = 2; $P<0.004$) were associated with the dogs' levels of obesity whereas the Labrador's field/role (Chi: $\chi^2 = 3.240$; d.f. = 2; $P<0.198$) was not. Comparison of veterinarians' opinions on such factors regarded coat colour (Chi: $\chi^2 = 1.22581$; d.f. = 2; $P>0.542$) and breed (Chi: $\chi^2 = 0.310345$; d.f. = 1; $P>0.577$) as not affecting the dog's levels of obesity, but that the dog's field/role (Chi: $\chi^2 = 56.3333$; d.f. = 4; $P<0.001$) did affect dog obesity levels. Dog owners (78.9%) and veterinarians (86.2%) demonstrated a preference for increased nutritional detail on dog food sources. Preferences for more health related advertisement words to be used, use of specific exercise for weight reduction benefits and specific diet guidance after de-sexing was observed from both samples. Overall, a reduction in Labrador obesity is sought: possible new preventive measures were established regarding improved education to owners, diet and exercise management that are specific to the Labrador retriever breed. Owners do relate the matter of obesity with future issues; health risks, costs, decreased welfare and decreased lifespan (Chi: $\chi^2 = 17.978$; d.f. =6; $P<0.006$). However, veterinarians do not perceive that owners associate dog obesity with future health problems and costs (Chi: $\chi^2 = 3.443$; d.f. =6; $P>0.752$) and so clear differences in the expectations of owners and what veterinarians perceive owners expectations regarding obesity to be are evident.

Keywords: Canine obesity, Questionnaire, Preventive measures, Owner's attitudes, Veterinarian opinions, Body Condition Scoring (BCS)

Introduction

Past decades have demonstrated an unprecedented and accelerated increase of obesity incidence amongst humans and animals worldwide (Bellisari, 2008; Klimentidis *et al,* 2011). Maintenance of recommended body weight across species is important with regards to survival; by optimising physiological and anatomical performance, and the upkeep of health. Canine obesity is currently the most recognised medical disorder in dogs in developed nations (Robertson, 2003). It is negatively linked to the development of health risks and diseases such as: diabetes mellitus, metabolic abnormalities and decreased immune functions (German, 2006). Examples of further implications obesity gives rise to are; decreased welfare (AWA, 2006), limited reproduction (Goodchild & Schwitzer, 2008) and behavioural effects (Markowitz, 1995; Mollá & Quevedo, 2011). The persistence of excess weight gain is of high concern, as is the importance of combating associated health disorders (Klimentidis *et al*, 2011).

The domestic dog (*Canis lupus familiaris*) is a well-established companion animal, bred extensively over centuries to allow selected and desired aesthetics, behaviours and physiological traits to be developed through pure and mixed breeds (Beckmann *et al*, 2010). Such desired traits have helped establish certain breeds into roles other than pets that are of benefit to humans. The Labrador retriever is commonly accepted as the most popular breed registered in the UK, with the Dog Kennel Club UK (DKC, 2010) registering 44,009. Although ultimately a pedigree breed, it is now often considered a novelty to own its crossbreeds. However, one disadvantageous predisposition of Labrador retrievers and its crossbreeds, is that they are known to be easily prone to overeating and notable weight gain (Gossellin *et al*, 2007a; Gossellin *et al*, 2007b). Even so, they continue to be a common breed due to their usage as pets, show dogs and working dogs; in roles such as tracking, hunting, rescue, therapy and guiding/disabled assistance (Ferasin & Marcora, 2009).

It is important in such working roles that weight is optimal in order for the best performance, and also as pets their weight should be ideal so as not to decrease the dog's welfare or longevity (Kealy *et al*, 2002). Burkholder & Toll (2000) define obesity in dogs as "the condition in which an animal exceeds its optimum bodyweight for the body size by at least 15%". The United Kennel Club standards (UKCS, 2004) recommend that working Labrador retriever males should weigh 65-80 pounds (29-35 kg) and females should weigh 55-70 pounds (25-32 kg). With regards to obesity in Labrador retrievers, it has and continues to be of great interest and importance due to the breed's present registered stature and working nature (Helmink *et al*, 2000; Cole *et al*, 2004).

Canine obesity causes are multifactorial and are currently incompletely understood. Many studies on obesity causes in domestic dogs and specifically Labradors have been investigated. The Animal Welfare Act (AWA, 2006) views the nutritional welfare of the animal under the responsibility of the owner. Balanced energy input and output levels are considered to be of high significance with regards to maintaining desired body weights. Another possibly overlooked cause is with regards to the education and knowledge of the nutritional value of commercial dog foods that are so widely used and readily available to dog owners at small costs.

Further studies have investigated the owner attitudes and opinions of their dog's administered diet and exercise. Bland *et al*, (2010) discovered that owners preferred

and expected to amend the diet of overweight dogs before seeking the advice of veterinarians, whereas veterinarians recommend that their advice is followed first. The earlier study by Bland *et al*, (2009) corroborated that dog obesity is 'affected by the interrelationships between food management, exercise and social factors'. Yet, not to inflict all blame onto owners, Beckmann *et al*, (2010) posited that, with regard to domestic dogs, the 'interactions between diet and genotype are exceedingly complex' and so leaves much to be further understood. Other studies have focused on the effects of neutering (Sanborn, 2007) and weight gain after recent weight loss (Fritsch *et al*, 2010).

Preventive measures play a vital role in the eradication of obesity and increasing quality of life (German *et al*, 2011a; German, *et al*, 2011b), and have been expanded and developed extensively with regard to the human obesity epidemic, such as; pharmaceutical administration, specific and detailed calorie and exercise information to target weight loss, surgical procedures, and psychological adjustment. Considering such extensive factors are involved in the causes of canine obesity, it seems that the very basic reduction methods of reduced feed (Kealy *et al*. 2002; Bosch *et al*, 2009; Fritsch *et al*. 2010) and increased exercise (Cutt et al, 2007; Gossellin et al. 2007b) are predominantly recommended to owners as general advice across all breeds. Other studies have delved into weight reduction techniques such as; using the microsomal transfer protein (MTP) in Labradors to decrease absorption of fat (Gossellin *et al*, 2007a), the use of pedometers to measure dog walking steps against body conditioning score (Chan *et al*, 2005), and even the use of accelerometers to monitor spontaneous movement in a home environment (Hansen *et al*, 2007). However, breed specific measures are yet to be completely developed.

The principal aim of this study was to identify new and improved preventive obesity measures specific to the Labrador retriever dog. The preventive methods considered took into account past findings of proven obesity causes in Labrador retrievers and also related to current and successful preventive methods used in humans. The recognition of possible new preventive methods was achieved by objectively comprising information and opinions from the owners and veterinarians of Labrador retrievers and investigation of evidence of possible biological and environmental factors that could potentially affect obesity prevalence in this specific breed.

Methodology

Questionnaire Design

Two separate questionnaires with various quantitative and qualitative questions were designed and administered to establish the care, management and obesity strategies with relation to the species specifics of Labrador retrievers. The questionnaires designed built on questions informed by Kobelt *et al*, (2003); Robertson, (2003); Carciofi *et al*, (2005); McGreevy *et al*, (2005); Bland *et al*, (2009); Bland *et al*, (2010) to guarantee consistency in current research. The questionnaires were also constructed under the guidance of Brunt (1997).

As most of the questionnaire responses were based on perceptions and opinions rather than verified facts; consideration of the validity of the questionnaire responses was taken into account (Courcier *et al*., 2011). Effects of untruthful and inaccurate responses were minimised by initially outlining the aims and purpose of the study to

targeted participants who might benefit from the results and find them of interest. Opportunities for additional information and to contact the researcher were also offered in order to provide support and added trust; encouraging answers to be of high validity. A pilot study was conducted prior to distribution of the final questionnaires, where constructive feedback was used to amend weaker areas of the survey. Sampling bias was reduced by random distribution techniques and anonymous responses. Question ambiguity was removed and the design was improved for better understanding.

The owner questionnaire comprised of thirty questions, of which twenty eight were closed questions and two were open ended questions. The open ended questions acquired owner demographics and also specific management of weight details of their Labrador regarding neutering. The remaining questions were comprised of three topic areas; firstly owner and dog demographics such as; age, gender, location and role; secondly, diet, exercise and weight management such as; body condition scoring (BCS) of the dogs using a five point scale pictogram choice (Fig.1) (Edney & Smith, 1986; German *et al*., 2006), and thirdly attitudes towards obesity management strategies. The questions were randomly distributed but also coincided with the corresponding topic area; this helped reduce biases such as question order effects, but also allowed the questionnaire to be of easier delivery. Data collection was allowed for up to two dogs per household and the questionnaire to be taken once per household.

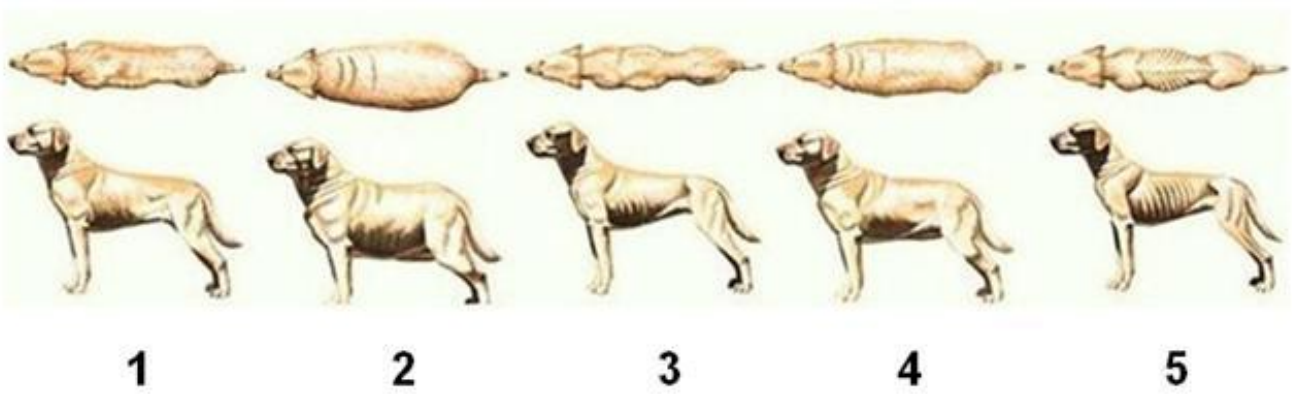

Fig.1 Labrador retriever body condition scoring (BCS) pictogram used in owner questionnaire to determine accurate estimation of Labrador's weight/body size (Purina, 2011).

The veterinarian questionnaire comprised of eighteen questions, of which fifteen were closed questions and three were open ended questions. The three open ended questions acquired veterinarian demographics and personal opinions regarding reasons of obesity in Labrador retrievers, with the responses categorised according to keywords. The remaining questions again were comprised of three topic areas; firstly veterinarian demographics such as; location and gender; secondly, reasons and owner contribution to obesity in Labrador retrievers; and thirdly attitudes towards obesity management strategies. Again the question distribution followed the same pattern and reasoning as the owner questionnaires.

Questionnaire Sampling

The questionnaires were distributed to Labrador retriever owners and veterinarians, with each questionnaire containing some different and some similar questions for comparison of opinions and identification of possible trends. The questionnaires were created online via a recommended and trusted survey website (Survey Monkey, 2011), and were distributed via email. Participants were sought via email to random contacts and through local dog/Labrador retriever and veterinarian websites; where potential for responses was high. The participants were emailed and asked to complete the survey and encourage other possible participants to, within a two month period. Both questionnaires were sought for ethical approval by the University of Plymouth, Faculty of Science and Technology Human Ethics for potential problems of bias, misleading questions, ambiguity, poor design, right to withdraw and validity. All responses were anonymous and withdrawal was identified through date of birth information given. Statistical analysis of data was conducted using the program Minitab 16. Discrete data, such as biological and environmental factors on Labrador obesity were analysed using Pearson's Chi-square test. Demographic data such as vet and owner preferences on new measures were arranged into tabulated results.

Results

Sample Demographics

A total of 140 responses were collected from owners and a total of 49 responses were collected from veterinarians over a two month period. Of the 140 owner responses, 12 of the completed data sets were excluded due to possible bias from the nature the participants were sought (were encouraged to take part in survey in local park or were personal acquaintances); concluding a total response count of 128. 36 owners also reported data for a second Labrador retriever of the same household, (in some data analyses this was excluded in order to remove sample bias or reduce sample randomisation). Of the 49 veterinarian responses, 3 participants did not complete the questionnaire or after participation wished to withdraw their data for reasons unknown. Sample demographics are shown in Table 1.

Table 1: Demographics of owners and veterinarians in a study of dog obesity preventive measures, U.K.

	Owner Responses	Veterinarian Responses
Number of responses	128	46
Location (urban: rural)	27.3% : 72.7%	78.3% : 21.7%
Gender (male: female)	27.3% : 72.7%	37.0% : 63.0%
Mean age group	46-60 44.6%	30-45 41.3%
% Of obese & grossly obese dogs recorded	57.0%	32.6% patients: 30-40% overweight

Possible Biological & Environmental Factors

Possible environmental and biological factors that could affect Labrador retriever obesity prevalence was investigated (all second dog data was excluded from this analysis to reduce same owner/household bias). The possible biological factor of coat colour was investigated and it was found that the levels of obesity were affected

by the colour of the Labrador (Chi: $\chi^2 = 10.964$; d.f. = 4; P<0.027), 70.5% of Black Labradors showed obese or grossly obese body levels (BCS 2 & 4) compared to chocolate at 55% and yellow at 30%. Yellow Labradors overall displayed best highest levels of recommended weight at 63% compared to chocolate at 42.5% and black at 29.5%. This compared to the results from veterinarian opinions that the levels of obesity were thought not to be affected by the colour of the Labrador (Chi: $\chi^2 = 1.22581$; d.f. = 2; P>0.542).

Another possible biological factor of whether the Labrador was cross bred or pure bred had an effect on their obesity prevalence was investigated. It was found that the breed of the Labrador affected the levels of obesity (Chi: $\chi^2 = 11.073$; d.f. = 2; P<0.004). Purebred Labradors were observed to be more predisposed to obese or grossly obese body levels (BCS 2 & 4) by 61.2% and recommended weight at 36.7% whereas cross breeds were less predisposed at an observed 43.3%, with 53.3% at recommended weight. This compared to the results from veterinarian opinions that the levels of obesity were thought by veterinarians as not to be affected by the breed of the Labrador (Chi: $\chi^2 = 0.310345$; d.f. = 1; P>0.577).

The environmental factor of the field/role of Labrador was investigated and found that the field/role of the Labrador unaffected the levels of obesity (Chi: $\chi^2 = 3.240$; d.f. = 2; P<0.198). More in depth analysis found that of Labradors in working roles 51.5% were obese or grossly obese body levels (BCS 2 & 4); with guide dogs demonstrating highest levels at 42.4% whereas pets showed to be more predisposed to higher body weights with 60.9% at obese and grossly obese. This compared to the results from veterinarian opinions that the levels of obesity were thought by veterinarians as to be affected by the field of the Labrador (Chi: $\chi^2 = 56.3333$; d.f. = 4; P<0.001). 56.5% of veterinarians chose pets as the most predisposed to obesity and guide dogs at 26.1%.

Preferences for Preventive Measures

Investigations of possible preferences for new or improved measures were investigated. Firstly by looking into nutritional content and labelling advertisements given. It was found that with regards to what nutritional value is given with dog foods, and compared to the amount of nutritional information given with human foods presently; such as calorie and energy input and use of additives, 78.9% of owner and 82.6% of veterinarians agreed they would find it beneficial if such information was conveyed on dog food packaging.

The preference for more nutritional information and where found were thought by owners as to be associated with one another and significant (Chi: $\chi^2 = 12.049$; d.f. =6; P<0.061). 75.9% answered yes to finding it beneficial if direct diet and nutrient information specifically to the Labrador retriever breed were found in; dog food packaging, up to date veterinary information packs, digital advertisements and physical advertisements (Fig.2.a). The preference for more nutritional information and where found were thought by veterinarians as not significant and not associated with each other (Chi: $\chi^2 = 4.795$; d.f. =6; P>0.570). However veterinarians did identify a preference for more nutritional detail to be given on dog food packaging. 61.4% answered yes to it being beneficial for Labrador retriever owners if direct diet and nutrient information specifically to the Labrador retriever breed were found in; dog food packaging, up to date veterinary information packs, digital advertisements and physical advertisements (Fig.2.b).

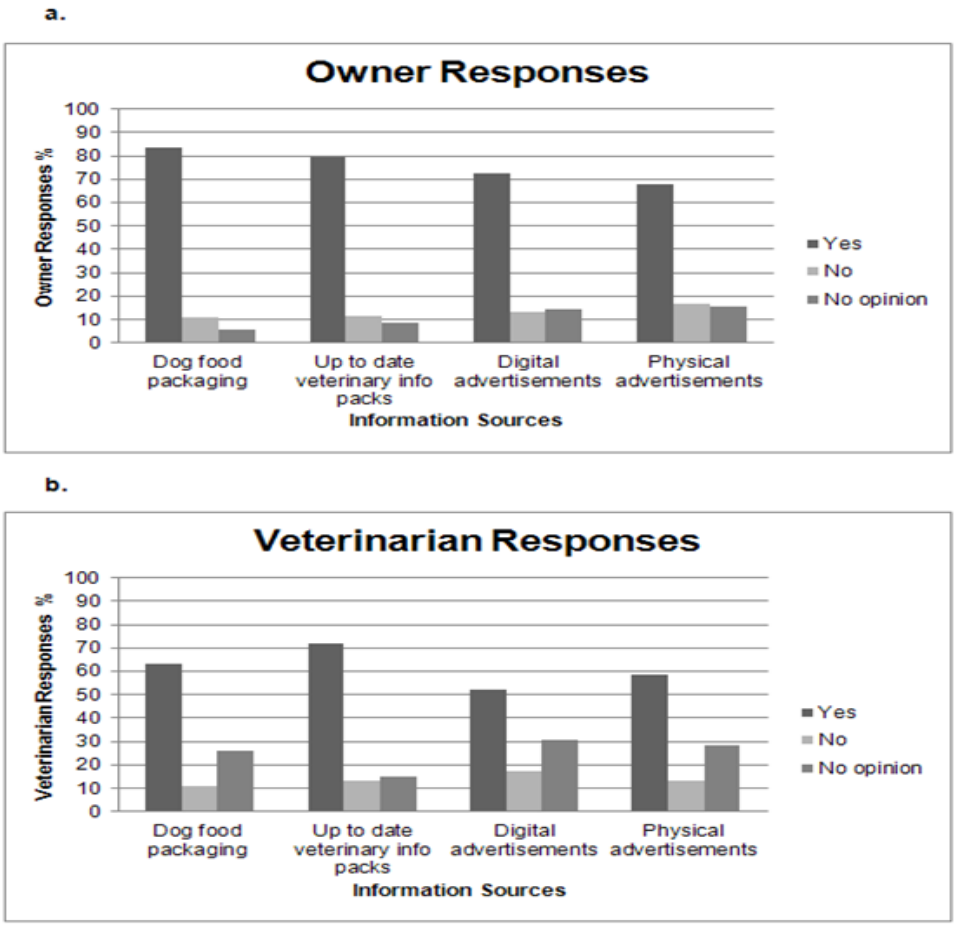

Fig 2: Frequency of Labrador retriever dogs' owners and veterinarian's preferences of the information sources that would most benefit improvement of nutritional content information.

Owners and veterinarians were presented with the top five words used for different types of dog foods and asked to rank on order of importance relating to owners purchase of food. The mean order of words chosen showed that veterinarians had a preference to words that reflected health such as; healthy (1), valued (2) and nourishing (3). Owners chose words relating to the foods state such as; healthy (1), fresh (2) and nutritious (3). This reflected health and nutritional value, rather than benefits and taste as viewed most important and influencing regarding owners purchase of dog food.

Secondly the idea of exercise specific to the Labrador was analysed, looking into the possible types of exercise that could have potential weight reduction benefits. Fig.3 shows that 69.5% owners perceive swimming as most beneficial, whereas 32.6% veterinarians perceive walking and running as equally most beneficial.

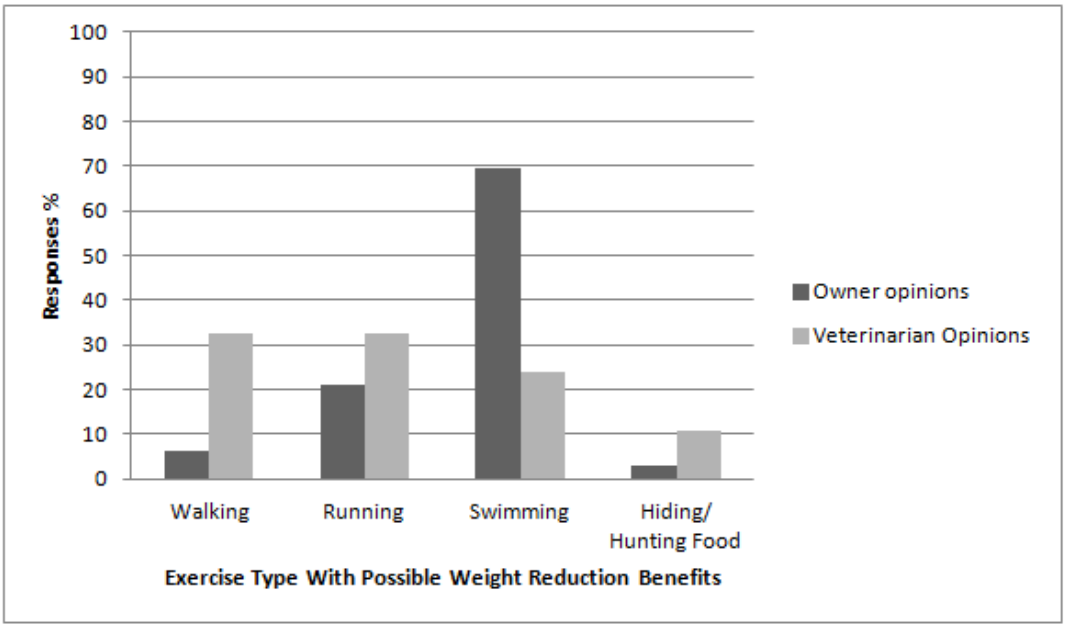

Fig 3: Frequency of Labrador retriever dogs' owners and veterinarian's preferences of what types of exercise could provide possible weight reduction benefits to obese Labrador retrievers.

The possibility of awareness of weight gain after neutering or spaying was investigated. Results showed that 68.7% of owners are unaware that de-sexing of their Labrador retriever can increase weight gain compared to 25% that were aware and 06.3% that had no opinion on the matter. This compared to the veterinarians perception that 67.4% do inform owners of the risk of weight gain, compared to 17.4% that do not and 15.2% that had no opinion. Results showed 75.2% of owners would find it beneficial if given advice and a strict diet plan to follow specific to Labrador retriever's post their Labrador's neutering or spaying. Within the sample (1st dog data only) it was recorded that 61.3% neutered males were obese compared to 18.5% of spayed females. 85.7% of not de-sexed males were obese compared to 16.7% not de-sexed females were obese.

Lastly, data on whether owners regard obesity as associated to further matters and circumstances was analysed. Owners do associate the matter of dog obesity with future health problems and costs (Chi: $\chi^2 = 17.978$; d.f. =6; $P<0.006$). Owners identified concern for future health problems to the dog at a mean 95% more than future health costs more at 90.6% did. Whereas, veterinarians do not recognise that owners associate the matter of dog obesity with future health problems and costs (Chi: $\chi^2 = 3.443$; d.f. =6; $P>0.752$). Veterinarians perceived that 50% of owners had concerns for future health costs, and a mean of 36% had concerns with future health problems. This demonstrates obesity and its future effects are of great concern to owners, and there is a substantial difference in veterinarian's expectations of owners concerns.

Discussion

The research encountered two limitations when developing the questionnaire and analysing responses. Firstly, the possibility of bias from owners answers that could imply obesity levels are present within the household; may have lead owners to give answers untruthfully and incorrect estimations of their obesity management (Brunt, 1997). This was sought to be overcome in the owner questionnaire by using the body condition scoring question to indicate an accurate estimation of the samples weight levels. The BCS technique has been used widely and developed in many past canine obesity papers, (Edney & Smith 1986; Bland *et al*, 2009; Bland *et al*, 2010; German *et al*, 2011) and is a reliable method to grade dog weight levels truthfully as most owners will answer true to their dogs body shape. Therefore results from this question were used throughout statistical analysis as a reliable indication of the samples true body weight levels. Sample bias regarding the demographics of both owners and veterinarians, for example, age and location was aimed to be lowered by largely distributing prompted emails containing the questionnaire to different target demographics, e.g. rural veterinarian practices, guide dogs etc.

The second limitation was the sample size in statistical analysis. Although the sample size was of a sufficient amount, problems occurred during statistical analysis and use of Chi: χ^2 as some response sizes were either too small or absent. For example, when analysing the environmental factor of dogs' role/field against obesity levels, some variables were unaccounted for; for example the role of track dogs had the response count of 0 for obese and grossly obese levels. This problem interfered with the Chi: χ^2 testing as it did not satisfy the assumption that the sample size must be large enough to allow the expected value to be greater or equal to 5 and so the calculated p-value was deemed invalid. This problem was overcome by grouping the variables so that the sample size was adequate; to working and pet Labradors, which ultimately allowed Chi: χ^2 to be calculated successfully. In future research a larger and more varied sample size would prove more beneficial in order for more detailed statistical analyses, and thorough conclusions to be made.

Overcoming of these limitations allowed for sufficient data analysis to be made and assumptions to be drawn from the data. Investigation of biological and environmental factors that could affect the obesity levels of Labrador retrievers found that obesity was more profound in black coated Labradors, and then chocolate coated and then yellow coated Labradors in the sample. Jones *et al*, (1981) found that different coloured strains of domestic hen hybrids exhibited different behavioural and physiological responses to fear; in the case of Labrador retrievers this result implies there may also be a physiological response to weight gain in different coloured strains; implying that black coated Labradors maybe more predisposed to weight gain than other coloured Labradors, even if their feeding behaviour is well monitored. However, this may be developed across a larger sample to test its reliability or if possible sample bias affected the results.

Purebred Labradors were found to be more predisposed to obesity body levels than cross bred Labradors in the sample. This could be due to the fact that the Labrador breed gains weight easily and when cross bred; and some hybrids do not always acquire the desired traits they are bred for and instead gain unwanted qualities such as weight gain, or in turn, possibly in this case, such hybrids can eradicate or weaken such traits such as weight gain. Diverse ranges of phenotypes and

genotypes amongst breeds have also led to inadvertent limitations being acquired in some breeds such as; genetic predispositions or metabolic disorders (Beckmann *et al*, 2010). Such predispositions in the purebreds can cause certain dog breeds to be more prone to weight gain and so at greater risk of morbidity or mortality.

The role/field of the Labradors in the sample was observed not to affect obesity body levels. However, pets and guide dogs were observed to be most obese, whereas track, hunt and show Labradors demonstrated recommended boy weight levels. Bosch *et al*, (2009) acknowledge that 'dog diets may differ in their effectiveness of maintaining satiety after a meal' and so the dog may experience increased; 'sensations of hunger, feeding motivation, physical activity and sensitivity to environmental stressors'. Due to the owners disabilities and needs it could also be possible that obesity management of guides dogs could be difficult and there has been an observed difficulty of maintenance of service dogs (Fairman & Heubner, 2000). *Helmink et al*, (2000) state that guide dogs, including the Labrador retriever breed, should weight 18-32kg. In Labrador retrievers a maximum weight of 32 kg is desired and any weight higher is regarded overweight or obese. Show, gun and track Labradors often perform high levels of physical activity and so have a high energy expenditure to balance energy intake levels (Klimentidis *et al*, 2011).

Preferences for new preventive measures were investigated and possible methods for future use in Labrador retrievers were identified. Increasing nutrient detail on dog foods was found to be of high preference to both owners and veterinarians, with more detail similar to seen on human food and more nutrient related words used on a wide variety of food information sources. Many laws and regulations are put in place to monitor such content such as the Federal Food, Drug, and Cosmetic Act of the U.S. (FFDCA, 2010) that all pet food should be safe to eat for humans; 'produced under sanitary conditions, contain no harmful substances, and be truthfully labelled', but compared to human foods the nutritional detail is noticeably more absent. Although past reports have demonstrated such laws being followed somewhat loosely; leading to food contaminations and owners choosing more carefully to healthier dog food brands (Tesfom & Birch, 2010), other research has demonstrated lack of clear nutrient content has led to a stronger attraction to price rather than nutrition content (Suarez *et al*, 2011). Therefore, a possible new method could be to increase nutrient detail on dog food information sources and to increase the awareness of food content, rather than attraction to price.

Preference for a detailed diet and exercise plan from veterinarians after de-sexing was also desired by owners, which in turn could help the management of obesity for Labradors who may become more at risk to weight gain after de-sexing. Such detailed guidance can also help in the long term to regain weight after weight loss. As previous research has demonstrated that weight regain is apparent in >half dogs after following a management programme; if not strictly adhered to (German *et al*, 2011b). Also varying the type of exercise used, especially running and swimming, was prioritised by veterinarians and owners, and could pose potential weight management benefits; such as psychological and physiological in humans when type of exercise is not repetitive and is varied. Overall, improving nutritional detail, education, support, advice and exercise type are effective methods derived from owner and veterinarian opinions in this study that could be used. These could also be adapted to suit Labradors affected by biological factors; such as nutritional labelled food designed specifically and administered to the black coated Labrador,

that could be more predisposed to weight gain than the yellow and chocolate coated Labrador.

The study identified possible new and improved preventive obesity measures for Labrador retrievers as aimed. However, results showed that owners seek the advice, and regard the guidance of veterinarians highly. Suarez *et al*, (2011) similarly found that lower price favoured over nutritional value in owners with overweight dogs, but viewed veterinarians as most valuable guides to diet and nutrition. This compares to past research where owners preferred and expected to amend the diet of overweight dogs before consulting advice of veterinarians, (Bland *et al*, 2010).The uncorrelated results of what owners opinions are and what veterinarians expectations of owners opinions to be, highlights that the support sought from veterinarians by owners may be misunderstood and weakened by veterinarians pre-misconceptions. If veterinarians further understood the Labrador retrievers want for obesity management guidance, then possible improvements and effective use of the methods could be made.

Preventive obesity methods are widely available and successful to humans to suit their individual needs. Such measures of beneficial success, understanding and resourcefulness are surprisingly, yet to be recognisably applied to other animal species. Most studies investigating canine obesity and their results have been aimed to be applied as a general theory across all dog breeds. In depth investigation into specific dog species and obesity is lacking. For instance, to whether obesity risk or prevalence can be affected by environmental factors such as: the dog's colour, breed or role (e.g. pet, show or working), and to whether changes of feed distribution in collaboration with the dog's nature (e.g. hunting breed – hide and find the food) can help reduce weight gain chances is to be of focus. Most causes of obesity have been generalised over the canine spectrum rather than focusing on individual breeds, and although research has provided an insightful and valuable overview of such causes; potential is still available to deepen the knowledge to a canine breed specific level.

This research has shown that more specific techniques are available to the Labrador retriever owner; to suit their dog individually. The methods suggested can be rewarding and more diverse than simply reduced feed and increased exercise; that is so often recommended. Increased education of food guidance, des-sexing implications and obesity risks specific to Labradors could be further improved for owners. Future work of comparisons of obesity preventive measures suited to other dog breeds could be made, to determine if preventive obesity measure success could be affected by specie specifics. Future developments could be then made to other dog breeds and possibly even other animal species; helping to reduce captive animal obesity. Thus it is important preventive measures are used to reduce positive correlations of occurrence between humans and animals within human environments (Klimentidis *et al*. 2011). Further information and research could be targeted at widening the possibilities of preventive measures by consideration of the in-depth causes and factors of obesity and how these can be deterred in various other effective ways. And although possibly judged by some people as applying human preventive measures to canine species as illogical and impractical, such subtle developments of innovative and insightful methods, such as suggested in this study, could hereby serve of great benefit to the dog and owner; in both the short term and long term battle with obesity.

Conclusion

Preventive measures play a vital role in the eradication of obesity and increasing quality of life (German et al., 2011a). This research found that overall, Labrador obesity is sought to be reduced by both veterinarians and owners: as possible new preventive measures were established regarding improved education to owners, diet and exercise management that are specific to the Labrador retriever breed. Biological factors were seen to affect dogs' obesity levels and so adaption of possible preventive measures to these specifics could prove more beneficial in weight reduction. However, clear differences were noted regarding the expectations and opinions of owners and veterinarian's Labrador obesity management. And so in order for effective use of such preventive methods specific to the Labrador retriever breed; owners and veterinarians need to demonstrate improved levels of understanding, expectations and obesity management strategies between one another first.

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