



# Feeding dogs from raised bowls – a survey of the practice among Italian owners

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**Abstract:** Feeding dogs from raised bowls is gaining popularity among owners, although being cited among the factors increasing the risk of gastric dilatation-volvulus in giant breeds. We aimed at investigating the prevalence of the practice among Italian owners, their stated reasons for it and whether it was associated to a different prevalence of health issues or undesirable behaviors. A convenience sample was recruited via social media and online filled-in questionnaires concerning 715 dogs were collected (mean age  $\pm$  SD,  $5.2 \pm 3.57$  years, mean weight = 19.4 Kg, SD = 12.2 kg). One-hundred and eighty owners (25.2%) declared to feed their dogs from raised bowls, thirty-eight of which stated they did so following veterinary advice. Thirty-one mentioned prevention of gastric dilatation-volvulus as the reason for their choice (12 having been advised on the topic by vets), 33 other advantages linked to easier swallowing or digestion. No significant differences were found in the prevalence of health issues or undesirable behaviors between dogs fed from raised bowls and those fed from non-raised bowls.

When dogs were divided in size categories according to their stated height at the withers, bigger dogs were more often said to be fed from raised bowls than smaller ones ( $p < 0.001$ ). Sighthounds being reported to be 43 cm or more tall at the withers were more often ( $p < 0.05$ ) fed from raised bowls than dogs of the same size category even if they were not taller. It is concluded the practice of feeding dogs from raised bowls is relatively widespread especially among bigger dogs and sighthounds owners and, therefore, both more scientific studies on its actual effect on dogs' health and more widespread information on them are needed.

*Key Words:* dog, feeding practice, sighthound, undesirable behavior, health problem

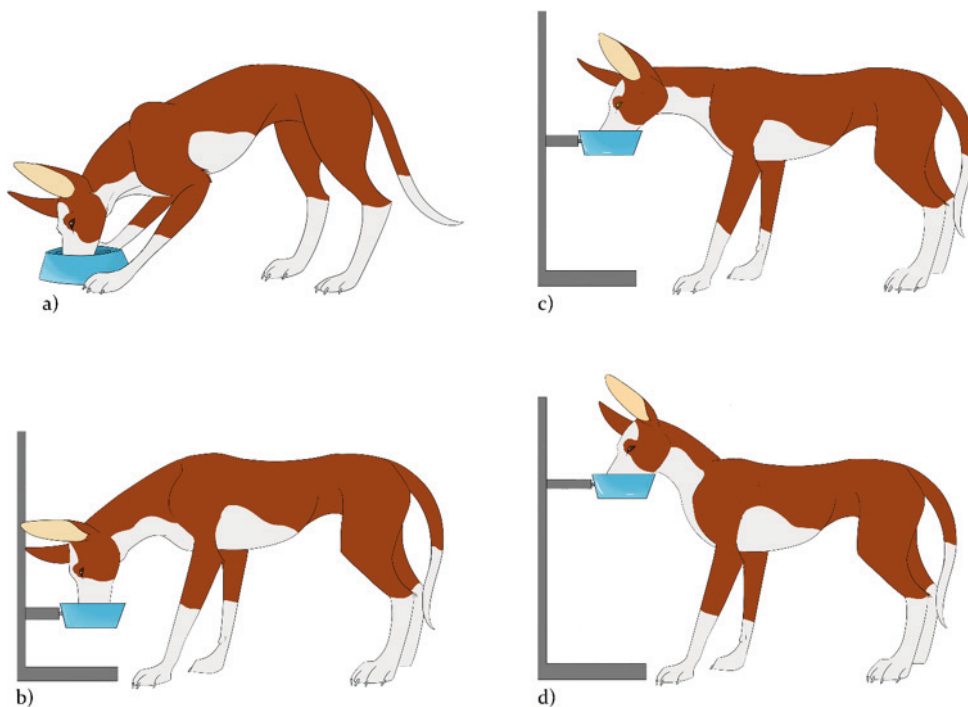
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## Introduction

In the last decade, there has been much interest on the link between the gastrointestinal system, diet and other organic systems and physiologic functions, including behavior, in humans (Cusotto et al., 2018) as well as in other animals (e.g., for dogs: Bosch et al., 2007; Dipace, 2015; Gatta et al., 2012; Kato et al., 2012; Kaulfuss et al., 2009). In this respect, not only the overall composition of the diet, but also how the diet is administered (e.g., Gazzano et al., 2018 on administering a carbohydrate morning meal) could have an effect. Feeding dogs from raised bowls (FRB) has been cited among the factors influencing the risk of gastric dilatation-volvulus (GDV) (Hand et al., 2010). The issue is, however, somewhat controversial (Buckley, 2017). Glickman et al. (2000a) found that FRB constituted a risk factor for GDV for dogs belonging to giant breeds (live weight  $> 45$  kg), but not for those belonging to large ones (live weight from 23 kg to 45 kg), whereas Pipan et al., 2012 did not find such an effect. The latter findings could be due to the fact that dogs of all heights were included in the survey. Moreover, several other factors can contribute to the risk of GDV (e.g., Glickman et al., 2000a, b; Raghavan et al., 2006). This notwithstanding, the practice of FRB is gaining popularity among owners (Buckley, 2017), as it is believed to have health beneficial

effects, ranging from prevention of GDV to putting less strain on the back and forelimbs muscles. A search on the scientific databank Scopus, using “dog and “raised” and “bowl” as keywords resulted in only two entries: Glickman et al. (2000a) paper and one which had nothing to do with raised bowls (raised and bowl being considered as separate keywords). No study was found investigating the possible effects on the muscle-skeletal system of the different postures a dog can take while feeding depending on the relative height of the dog and the bowl (Fig. 1), although muscle-skeletal pain is likely to have significant effects on the animal, and it is even reported to alter his/her behavior (Mills et al., 2020).

Therefore, the aim of the present study was to investigate the prevalence of FRB among Italian owners, the reasons for it and the possible association between feeding dogs from raised bowls and the reported prevalence of health issues and undesirable behaviors.



**Figure 1.** Different possible positions of a dog while feeding from a raised bowl (drawings by Andrea Emanuela Corsini).

## Materials and Methods

A dedicated questionnaire was developed for the present study, consisting of five sections:

1. some simple demographic information about the owner (e.g., gender, number of people in the household, number of dogs owned at present);
2. information about the dog (age, weight, height, sex, source, access to the home);
3. health issues and undesirable behaviors (i.e., if there was some and what they were);
4. kind of diet and how was food/water administered (including whether fed from a raised bowl)
5. reasons for the choice to feed from either raised or non-raised bowls.

The question about undesirable behavior was included in the survey on the ground that even subclinical/undiagnosed medical situations (e.g., gastric or muscle-skeletal), especially if involving discomfort and or pain, could predispose to undesirable behavior (Camps et al., 2019; Mills et al., 2020). The questionnaire was uploaded on google forms and the link was publicized on social media, in order to gather a convenience sample of responders. Usable data on 715 dogs (145 intact females, 233 spayed females, 237 intact males, 100 castrated males) were collected and descriptive statistics were run. Yates-corrected chi-square tests were run to investigate possible differences in the prevalence of health problems (both in general, and specifically for gastrointestinal and muscle-skeletal ones) and of undesirable behaviors between DFRB and dogs fed from non-raised bowls.

Owners provided information regarding the height at the withers for 673 of their dogs. However, eight of these entries were excluded from the analysis regarding size category and ratio of dogs fed from raised bowls because of some discrepancies between declared breed/weight and the declared height at the withers (e.g., an Italian Greyhound aged 6 years and weighing 6 kg who was declared to be 58 cm tall at the withers). The remaining 665 dogs were divided into four size groups depending on the height at the withers the owner had declared, following Žák et al. (2015). The four groups were: small dogs (less than 35 cm high), medium sized dogs (from 35 cm to 50 cm), large dogs (with a height exceeding 50 cm and up to 65 cm), and giant dogs (>65 cm), and the ratio of dogs fed from raised bowls (RDFRB) was compared among groups using Kolmogorov Smirnov probability tests. Pairwise comparisons were run using either a Yates corrected Chi Square or a Fisher Exact test, and applying Bonferroni correction for multiple comparisons. RDFRB is intended as the number of DFRB in a group vs the number of dogs not fed from a raised bowl in the same group. However, homogeneity regarding the studied variable within each size group was also checked for, by comparing the RDFRB among dogs in the lower half of that group height range to that of the higher half using either a Yates-corrected Chi Square or a Fisher Exact test. The results of such analysis led to split the medium sized dogs into two groups: medium sized dogs with a declared height at the withers of less than 43 cm (medium 1), and medium sized dogs with a declared height at the withers of 43 cm or more (medium 2).

As behavioral complaints have been shown to differ depending on dog size (Martino, 2017), we used Yates corrected Chi Square or Fisher Exact tests also to compare dogs fed from raised bowls (DFRB) to other dogs regarding undesirable behaviors within each size group. The same was done for health problems. The same tests were used when comparing the ratio of sighthounds fed from raised bowls to that of other dogs within each size group, and to compare the prevalence of behavioral complaints between sighthounds and other dogs. Differences in heights at the withers between sighthounds and other dogs was tested using a U-Mann Whitney test performed with Statistica V.13 (Statsoft, Hamburg, Germany). When sighthounds were compared to non-sighthound dogs, a total sample of 662 dogs was used, thus excluding the three dogs whose breed was not given.

## Results and Discussion

One-hundred and eighty owners declared FRB (25.2%), 38 of which following veterinary advice. Thirty-one mentioned prevention of GDV as the reason for their choice (12 having been advised on the topic by vets), 33 other advantages linked to easier swallowing or digestion, 47 advantages linked to a better posture while eating, which caused less strain on the muscle-skeletal apparatus and/or was supposedly more comfortable for the dog. Only seven had actually observed their dog while eating both from a raised and from a non-raised bowl and deemed the dog was happier/more comfortable eating from the former. Only six owners among the ones feeding from a non-raised bowl declared to have been advised to do so by a vet (in two cases as prevention of GDV, one for a 60 cm at the withers tall dog, one whose height was not declared), whereas two

cited having read a scientific paper as the reason for their choice.

On the total sample, there was no difference in the prevalence of health problems in general (Yates-corrected chi-square=0.52, df=1, p=0.47), gastrointestinal (Fisher exact test, p=0.42), muscle-skeletal (Yates-corrected chi-square=0.1, df=1, p=0.77) ones and of undesirable behaviors (Yates-corrected chi-square=2.47, df=1, p=0.12) between DFRB and dogs fed from non-raised bowls.

When dogs were divided into size categories, the four groups significantly differed in their RD-FRB (Chi Square = 49.19; df=2, p<0.001). In detail, small dogs were fed from raised bowl less often than dogs in any other group (all Fisher Exact test, p<0.001) and medium sized dogs less often than large (Yates corrected Chi Square = 8.9, df=1, p=0.003) and giant ones (Yates corrected Chi Square = 26.5, df=1, p<0.001). The prevalence of FRB for large (34.4%) and giant (53.3%) dogs in the present study are similar to those reported by Glickman et al. (2000a; 30% and 54%, respectively) although size categories were defined using different criteria in the two studies.

When homogeneity within each size group was checked for, medium sized dogs (272 in total) were not a homogenous group as regards to the RDFRB. There was a significant difference (Yates corrected Chi square =8.6, df=1, p=0.003) in the RDFRB between dogs stated to be from 35 cm to less than 43 cm high at the withers and dogs with a declared height at the withers from 43 to 50 cm. The medium sized dog group could, thus, be divided into two groups: medium\_1 (including dogs stated to be from 35 cm to less than 43 cm high at the withers) and medium\_2 (including dogs with a declared height at the withers from 43 to 50 cm). Overall the five groups were statistically different in RDFRB (Chi square = 85.7, df=2, p<0.001, Table 1).

**Table 1.** Dog groups based on size and their main characteristics. \* Stands for a statistically significant difference between sighthounds and non-sighthounds in dogs fed from raised bowls (p<0.01).

Size group	Small	Medium_1	Medium_2	Large	Giant
Height at the withers (in cm)	Less than 35	From 35 to less than 43	From 43 to 50	More than 50 to 65	More than 65
N° of dogs	143	120	152	175	75
Ratio sighthounds/non-sighthounds	13/129 (breed not specified for one dog)	27/93	46/104 (breed not specified for two dogs)	38/137	14/61
Average age (± standard deviation)	6.2 (±4.2)	5.5 (±3.6)	5.1 (±3.6)	4.7 (±3.1)	4.4 (±3.2)
% of dogs fed from raised bowls on the total n° of dogs (% sighthounds - % non-sighthounds)	3.5 (15.4 - 2.3)	13.3 (11.1 - 14.0)	28.9 (56.5 - 17.3)*	34.4 (57.9 - 29.2)*	53.3 (92.9 - 44.3)*
% health problems (gastrointestinal - muscle-skeletal)	22.4 (1.4 - 4.9)	15.0 (2.5 - 4.2)	11.2 (1.3 - 3.9)	16.0 (4.0 - 4.6)	13.3 (2.7 - 5.3)
% undesirable behaviors	27.7	27.5	18.4	17.7	17.3

When pairwise comparisons were done using Bonferroni correction, the difference between “medium\_1” and “medium\_2” groups in RDFRB remained significant; the RDFRB in “medium\_1” group was different from that in “large” and “giant” dogs (vs large: Yates corrected Chi square =16.7, df=1, p<0.0001; vs giant Yates corrected Chi square =34.1, df=1, p<0.0001). The RDFRB in medium\_2 group was different from that of the “small” (Fisher Exact test p<0.0001) and the “giant” dogs (Yates corrected Chi square =11.79, df=1, p=0.0006). The RDFRB in “medium\_1” group was not different from that of the “small” dogs (Fisher Exact test p=0.0051).

In size groups “medium\_2”, “large” and “giant”, sighthounds were more often said to be fed from raised bowls than non-sighthounds (p<0.001, p=0.0021 and p=0.006, respectively) even if they were

not taller. In groups medium\_2 and large, the reported height at the withers of sighthounds was even less than that of non-sighthounds (medium\_2:  $Z=4.5$ ,  $df=1$ ,  $p<0.001$ ; large:  $Z=5.7$ ,  $df=1$ ,  $p<0.001$ ).

Also within groups, no statistically significant differences were found between DFRB and dogs fed from non-raised bowls in the prevalence of health problems (general – “small” and “giant”:  $p=1.0$ , “medium\_1”:  $p=0.71$ , “medium\_2”:  $p=0.57$ ; “large”: Chi-Square=0.46,  $df=1$ ,  $p=0.50$ ; gastrointestinal - medium\_1  $p=0.35$ ; large:  $p=0.44$ ; all other groups:  $p=1.0$ ; muscle-skeletal – large:  $p=0.25$ ; all other groups:  $p=1.0$ ). The result about gastrointestinal problems appears to disagree with what found by Glickman et al. (2000a), who found an increased risk of GDV in giant breeds when fed from raised bowls. However, in the analyses used in the present as well as the questionnaire used in Glickman et al. study (Glickman et al., 2000a; 2000b) bowl position was categorized only dichotomously as “raised” or “not raised/ground level”. As can be seen in Fig.1, a raised bowl can induce different positions in the dog feeding from it, as regards to respective heights of withers, trunk and scruff of the neck depending on the relative height of the bowl and the dog. No statistically significant differences were found between DFRB and dogs fed from non-raised bowls in the prevalence of undesirable behaviors (“small”:  $p=0.32$ , “medium\_1”:  $p=0.55$ , “medium\_2”:  $p=0.37$ ; “large”: Chi-Square=0.05,  $df=1$ ,  $p=0.83$ ; “giant”:  $p=0.56$ ). The prevalence of behaviors perceived as undesirable by owners in the present study was lower than what found by both Wells and Hepper (2000) and Vacalopoulos and Anderson (1993). However, the two abovementioned studies refer to specific subpopulations of dogs: dogs in veterinary hospitals for the latter and adopted dogs for the former. Dogs adopted from associations/shelters may be more at risk of behavioral problems, as the stressful experience of relinquishment/impoundment can affect later behaviour and predispose to them (Tuber et al., 1999), whereas dogs taken to the veterinary hospital might be more at risk because of the link between health problems and undesirable behaviour (Mills et al., 2020). An interesting side-finding of the present study was that sighthounds in the Medium\_2 group were reported to have undesired behaviours significantly less often than non-sighthound dogs in the same size group (3 out of 28 vs 43 out of 124; Fisher Exact test  $p=0.01$ ).

Given the results of the present survey, it would be important to further investigate the possible effects of different height of the feeding bowl as compared to the height and the conformation of the dog on the risk of developing GDV or other problems.

## Conclusions

The present study is a first attempt at investigating the practice of feeding dogs from raised bowls and the reasons the owners declare for it. Such practice appears to be used by a fourth of the participating Italian owners, and the 66.7% of the people using it declare to do so because of health reasons, including prevention of GDV. Taller dogs are reported to be fed from raised bowls more often than shorter ones, and sighthounds more often than non-sighthounds. No association was found between feeding dogs from raised bowls and the reported prevalence of health issues and undesirable behaviors. Given the relatively high percentage of owners feeding dogs from raised bowls, especially among large and giant breeds, both more dedicated scientific studies on its actual effect on dogs' health and more widespread information on the topic are needed.

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## References

- Bosch G., Beerda B., Hendriks W. H., van der Poel A. F. B., Verstegen M. W. A. Impact of nutrition on canine behaviour: current status and possible mechanisms. *Nutr. Res. Rev.* 2007; 20: 180-194.
- Buckley, L. A. Are dogs that are fed from a raised bowl at an increased risk of gastric dilation volvulus compared with floor-fed dogs? *Veterinary Evidence* 2017; 2(1): 1-10.
- Camps T., Amat M., Manteca X. A Review of Medical Conditions and Behavioral Problems in Dogs and Cats. *Animals* 2019; 9: 1133; doi:10.3390/ani9121133
- Cusotto S., Sandhu, K. V.; Dinan, T. G., Cryan J. F. The Neuroendocrinology of the Microbiota-Gut-Brain Axis: A Behavioural Perspective. *Front. Neuroendocrin.* 2018; 51:80-101.
- Dipace V. Tryptophan effect on dog behavior: a review. *Dog Behav.* 2015; 3: 23-31.
- Gatta D., Casini L., Pellegrini O., Lubas G., Gazzano A. Effetto sull'emissione fecale del cane di due diete a diversi livelli di carboidrati ed origine proteica e possibili effetti sul comportamento. *Veterinaria.* 2013; 5: 7-12.
- Gazzano A., Ogi A., Torracca B., Mariti C., Casini, L. Plasma Tryptophan/Large Neutral Amino Acids Ratio in Domestic Dogs Is Affected by a Single Meal with High Carbohydrates Level. *Animals* 2018; 8(5): 63.
- Glickman L.T., Glickman N. W., Schellenberg D.B., Raghavan M. Non-dietary risk factors for gastric dilatation-volvulus in large and giant breed dogs. *J Am Vet Med Assoc* 2000a; 217(10): 1492-1499.
- Glickman L.T., Glickman N. W., Schellenberg D.B., Raghavan M. Incidence of and breed-related risk factors for gastric dilatation-volvulus in dogs. *J Am Vet Med Assoc* 2000b; 216: 40-45.
- GraphPad, 2018. Quickcalcs – Analyze a 2x2 contingency table. <https://www.graphpad.com/quickcalcs/contingency2/>, last accessed 15/06/2020
- Hand M.S., Thatcher C.D., Remillard R.L., Roudebush P., Novotny B.J. 2010. *Small Animal Clinical Nutrition*, 5th Edition, Mark Morris Institute.
- Kato M., Kazuki M., Nobuyo O., Mitsuaki O. Effects of prescription diet on dealing with stressful situations and performance of anxiety-related behaviors in privately owned anxious dogs. *J.V.B.* 2012; 7: 21-26.
- Kaulfuss P., Hintze S., Wurbel H. Effect of tryptophan as dietary supplement on dogs with abnormal-repetitive behaviors. *J.V.B.* 2009; 4: 97.
- Martino A. Exploring the influence of size on undesired behaviors of domestic dogs. *Dog Behav.* 2017; 1: 1-12.
- Mills D. S., Demontigny-Bédard I., Gruen M., Klinck M. P., McPeake K. J., Barcelos A. M., Hewinson L., Van Haevermaet H., Denenberg S., Hauser H., Koch C., Ballantyne k., Wilson C., Mathkari C. V., Pounder J., Garcia E., Darder P., Fatjó J., Levine E. Pain and problem behavior in cats and dogs. *Animals* 2020; 10: 318; doi:10.3390/ani10020318.
- Pipan, M., Cimino Brown, D, Battaglia, C. L., Otto, C. M. An internet-based survey of risk factors for surgical gastric dilation-volvulus in dogs. *Journal of the American Veterinary Medicine Association* 2012; 240(12): 1456 – 1462; <http://dx.doi.org/10.2460/javma.240.12.1456>
- Raghavan M., Glickman N. W., Glickman L. T. The effect of ingredients in dry dog foods on the risk of gastric dilatation-volvulus in dogs. *J. Am. Anim. Hosp. Assoc.* 2006; 42(1): 28-36.
- Scopus (<https://www.scopus.com/search/form.uri?zone=TopNavBar&origin=resultslist&display=basic>), last accessed 17/06/2020
- SISA – Ordinal 2x5 exact. <https://www.quantitativeskills.com/sisa/statistics/ord2.htm>, last accessed 15/06/2020
- Tuber, D. S., Miller, D. D., Caris, K. A., Halter, R., Linden, F., and Hennessy M. B. 1999. Dogs in animal shelters: problems, suggestions, and needed expertise. *Psychol. Sci.* 10(5): 379-386.
- Vacalopoulos A., Anderson R. K. Canine behaviour problems reported by clients in a study of veterinary hospitals. *Appl. Anim. Behav. Sci.* 1993; 37: 84.
- Žák J., Voslášková E., Večerek V., Bedáňová I. Sex, age and size as factors affecting the length of stay of dogs in Czech shelters. *Acta Veter. Brno* 2015; 84(4): 407-413.

## Alimentare i cani con ciotole sollevate da terra: un'indagine tra i proprietari italiani

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### *Sintesi*

L'uso di alimentare i cani da ciotole sollevate sta guadagnando popolarità tra i proprietari, anche se viene citato tra i fattori che aumentano il rischio di dilatazione-volvolo gastrico nelle razze giganti. Abbiamo voluto indagare la prevalenza di tale pratica tra i proprietari italiani, e le ragioni che i proprietari dichiaravano alla base di tale scelta. Inoltre, abbiamo voluto investigare se tale pratica fosse associata a una diversa prevalenza di problemi di salute o di comportamenti indesiderati. Usando un questionario on-line, pubblicizzato sui social media, sono stati raccolti dati riguardanti 715 cani (età media  $\pm$  SD,  $5,2 \pm 3,57$  anni, peso medio = 19,4 Kg, SD = 12,2 Kg). Centottanta proprietari (25,2%) hanno dichiarato di alimentare i loro cani da ciotole sollevate. Trentotto di essi hanno dichiarato di farlo seguendo il consiglio del veterinario. Trentuno hanno citato la prevenzione della dilatazione-volvolo gastrico come motivo della loro scelta (12 dichiarando di essere stati consigliati sull'argomento da veterinari), 33 citando altri vantaggi legati ad una più facile deglutizione o digestione. Non sono state riscontrate differenze significative nella prevalenza di problemi di salute o comportamenti indesiderati tra i cani alimentati da ciotole sollevate e quelli alimentati da ciotole non sollevate.

Quando i cani sono stati divisi in categorie di taglia in base alla loro altezza al garrese dichiarata dai proprietari, i cani più alti sono risultati più spesso alimentati da ciotole sollevate rispetto a quelli più piccoli ( $p < 0,001$ ). I levrieri di 43 cm o più di altezza al garrese sono risultati essere alimentati più spesso ( $p < 0,05$ ) da ciotole sollevate rispetto ai cani della stessa categoria di taglia, anche se non erano più alti. Si conclude che la pratica di nutrire i cani da ciotole sollevate è relativamente diffusa soprattutto tra i proprietari di cani di altezza maggiore e di levrieri. Da quanto rilevato in questo studio si evince come siano necessari sia un maggior numero studi scientifici sugli effetti di tale pratica sulla salute dei cani, sia una maggiore diffusione delle informazioni sull'argomento.

