Revista electrónica

Short Communication

Home-made device improves the behavior of group housed dogs

Dispositivo casero mejora el comportamiento de perros alojados grupalmente

Pedro Paredes-Ramos[1,2]*, Jorge Manzo[2], Genaro A Coria-Avila[2]

[1]*Department of Pharmacology, University of Maryland School of Medicine,*
[2]*Centro de Investigaciones Cerebrales, Universidad Veracruzana.*

Received: September 03, 2014 Accepted: October 13, 2014
Find this paper at: http://www.uv.mx/eneurobiologia/vols/2014/5/10.html

Abstract

Full time group housing increase the incidence of unwanted behaviors and decrease the frequency of positive behaviors in animals. Feeding devices can enrich the environment of animals in captivity and improve their behavior. Herein, we evaluated the effect of a home-made feeding bottle-device, which delivers kibbles in response to the dog manipulation, on the frequency of social play and interspecific aggressions of group-housed shelter dogs. We manipulated the number of dogs housed together (Crowded or Uncrowded) and the use of the home-made bottle-device (+Bottle), as follows: I) Crowded corral with empty bottle (Crowded), II) Crowded corral with filled bottle (Crowded+Bottle) III) Uncrowded corral with empty bottle (Unrowded), and IV) Uncrowded corral with filled bottle (Uncrowded+Bottle). Results indicated that during the +Bottle periods, dogs increased the frequency of social play and decreased the incidence of fights. In addition during the Uncrowded+Bottle period, the amount of fights was lower than the rest of conditions. This study offers evidence of a cheap and functional strategy to improve the behavior of group-housed dogs.

Keywords: Dog behavior, Feeding enrichment, Aggression, Social play, Welfare.

Resumen

El alojamiento de perros en forma grupal incrementa la aparición de problemas de comportamiento, y la disminución de comportamientos sociales positivos como el juego. El uso de dispositivos para enriquecer el ambiente de animales en cautiverio puede mejorar su estado de bienestar y disminuir la incidencia de conductas indeseadas. En este estudio evaluamos el efecto de un dispositivo de alimentación casero sobre la conducta de juego y de peleas en perros albergados grupalmente en un refugio para animales. El efecto del dispositivo sobre dichas conductas se evaluó en las siguientes condiciones: I) grupos sobrepoblados con dispositivos vacíos (Sobrepoblado), 2) grupos sobrepoblados con dispositivos llenos con croquetas (Sobrepoblado+Dispositivo), 3) grupos no sobrepoblados con dispositivos vacíos (No Sobrepoblado), y 4) grupos no sobrepoblados con dispositivos llenos con croquetas (No Sobrepoblado+Dispositivo). Los resultados indicaron que durante los periodos en que los dispositivos fueron llenados de croquetas y por lo tanto usados por los perros, el número de peleas disminuyó mientras que la frecuencia con que los perros jugaron aumentó. Asimismo, durante el periodo en que no hubo sobrepoblación y los dispositivos fueron llenados con croquetas (No Sobrepoblado+Dispositivo) los perros mostraron los niveles de peleas más bajos en comparación con el resto de condiciones. En conclusión, este estudio ofrece la primera evidencia de un dispositivo de alimentación casero que mejora el comportamiento de perros albergados grupalmente en un refugio para mascotas.

Palabras clave: Comportamiento en perros, Enriquecimiento ambiental, Peleas, Juego, Bienestar animal.

*Corresponding Author: Pedro Paredes-Ramos, Ph.D. Department of Pharmacology, University of Maryland School of Medicine, Baltimore, MD. USA, 410-706-2254. email: yeiparedes@gmail.com

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1. Introduction

Dogs have a very active and positive role in human society, and yet every year animal shelters rescue and house thousands of homeless and unwanted dogs around the world. The main goals of shelters is to provide temporary housing, feeding and to facilitate the subsequent adoption. Thus, during the time spent in the shelter, dogs are expected to display acceptable behavior as an indicator of welfare, which as a rule of thumb must occur if the shelter allows the fulfillment of their basic needs via the five Brambell´s freedoms[1]. Namely, 1) access to fresh water and to a diet so that they maintain full health and vigor, 2) appropriate environment, 3) rapid diagnosis and treatment of diseases, 4) sufficient space and company, and 5) conditions to minimize mental suffering. Unfortunately, welfare is constantly jeopardized because the entrance rate of dogs into the shelters is higher than the adoption rate, which in group-housed dogs leads to overcrowded corrals[2]. This situation facilitates the incidence of abnormal behaviors and decreases the frequency of positive behaviors such as social play.

1.1 Environmental enrichment

Environmental enrichment can help captive animals to cope with the stress[3]. Accordingly, a good environmental enrichment program for group-housed dogs might decrease unwanted behaviors even under overcrowded conditions. Evidence indicates that feeding devices may enrich the environment of group-housed animals, which decrease the stress and increase the incidence of positive behaviors[4-6]. For instance, in one study the effect of enrichment devices was evaluated on the behavior of males and females captive gorillas in an age range from 4 to 36 years old. Devices included paper bags and cardboard boxes containing food items and straw bedding. Under different experimental conditions, the authors reported that the feeding enrichment increased social and solitary play behaviors[5]. Unfortunately few studies have evaluated the use of feeding enrichment devices in dogs. To our knowledge all these studies have been performed on single housed dogs. Herein, we decided to assess whether the use of a home-made feeding enrichment device would modify and improve the behavior of group-housed shelter dogs.

2. Methods

2.1 Ethical statement

This experimental protocol was approved by a committee of the Center for Studies in Brain Research (Centro de Investigaciones Cerebrales), Universidad Veracruzana, Mexico and by the society for the prevention of cruelty to Animals "Amigos de los animales, AC XALAPA" following the Official Mexican Standard NOM-062-ZOO-1999 (Technical Specifications for the Production, Care and Use of Animals).

2.2 Animals and location

The study was carried out at the animal shelter "Amigos de los Animales" located at Xalapa city, in Veracruz State, Mexico. We used a total of 42 dogs (30 females and 12 males) that had been in the shelter for at least six months. They were spayed/neutered, medium-sized, mixed breed, and aged 14-48 months. Previous to housing the animals in the adoption area, every dog is carefully evaluated by a Veterinarian who determines if the animal is healthy and adequate to be adopted. According to the Mexican law, a medium-sized dog (up to 30 kg of body weight) must be housed in facilities of 1.11m^2 or larger (NOM-062-ZOO-1999, paragraph 5.3.1.2). In our study, dogs were kept in group-housed conditions that provided a minimum of 2.14m^2 for each dog.

2.3 Home-made feeding bottle-device

We used empty two-liter plastic bottles filled with 200 grams of commercial kibbles for

dogs (same brand as for regular feed), suspended with a cord at 90 centimeters from the ground. Commercial labels were removed from the plastic bottles and instead one square hole of 3x3 inches was made, which allowed inserting the kibbles. Four 0.5 x 0.5 inches square holes were made in the base of the bottles so that kibbles would fall down as a result of licking, poking and/or pawing (Figure 1). Two bottle-toys were placed in each corral. Bottle-device construction and dog performance can be watched at the following link: http://www.youtube.com/watch?v=HoozLYVI46U.

2.4 Experimental conditions

We manipulated the number of dogs in each corral and the use of the home-made feeding bottle-device. This resulted in four consecutive conditions of twelve days each: I) Crowded corral with empty bottle-devices (Crowded), II) Crowded corral with filled bottle-devices (Crowded+Bottle), III) Uncrowded corral with empty bottle-devices (Uncrowded), and IV) Uncrowded corral with filled bottle-devices (Uncrowded+Bottle). During the Crowded periods, dogs were housed in groups of 14 individuals (10 females and 4 males). During the Uncrowded periods 4 dogs (2 males and 2 females) were randomly selected to leave the corral so that only 10 individuals were housed together (8 females and 2 males). During the +Bottles periods, feeding bottle-devices were filled with kibbles every day at 10:00 a.m. and dogs were left undisturbed to use them to obtain the kibbles. 20 minutes later the bottle-devices were empty. Corrals were handled everyday by the same animal caretaker. Dogs had access to shade and sunny areas had water *ad libitum* and were fed at 8:00 am each day. Feed consisted of about 300 grams of adult kibbles Pedigree® for each dog. Every morning the corrals were washed and the caretaker removed the dog´s feces from the corrals every two hours.

2.5 Behavioral Analysis

Behavior was assessed from 10:30 to 12:30 hrs. From Monday to Saturday same person (PP-R) observed dog´s behavior and counted the frequency of social play and fights. Social play and fights were considered as such only if the play solicitation or aggression triggered the same kind of behavior in the receptor dog. Both social play and fights are made up of motor patterns characteristic of predatory, agonistic and courtship behavior. Nevertheless, social play unlike fights is accompanied by play solicitations.

Figure 1. Bottles-devices were filled with commercial kibbles for dogs and suspended with a cord. During the +BOTTLE periods, dogs smelled, poked, and pawed the bottles-device to obtain the kibbles.

3. Statistical analysis

We used one-way analysis of variance ANOVA to detect significant differences in the amount of behaviors during the different periods. Alpha level was set at $p<0.05$, and when significant differences were detected a Tukey HSD *post hoc test* was conducted.

4. Results

The One-way ANOVA detected significant differences in the amount of social play in dogs $F(3, 44) = 59.34$, $p < 0.05$. The *post hoc test* revealed that dogs displayed more social play during the +Bottle periods. Figure 2

shows the significant differences in the amount of social play. Likewise, the ANOVA detected an effect in the number of fights F (3, 44) = 47.05, p <0.05. The *post hoc test* revealed that both Crowded+Bottle and Uncrowded conditions were able to decrease the number of fights or interspecific aggressions in dogs as compared with Crowded condition. Interestingly, during the Uncrowded+Bottle condition, dogs significantly decreased the amount of fights as compared with the rest of periods. During Crowded period bottle-toys remained empty, in Crowded+Bottle feeding toys were filled with kibbles. Significant differences are expressed in Figure 3.

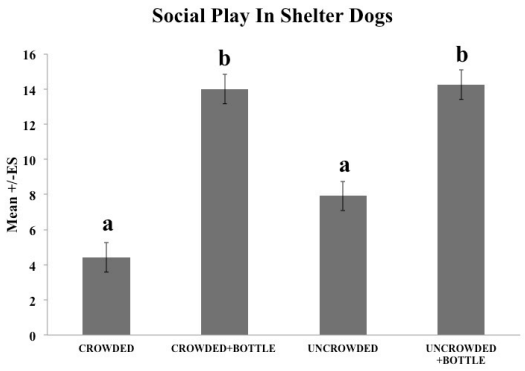

Figure 2. Mean number +/- SEM of social play in group housed shelter dogs. During the Crowded+Bottle and Uncrowded+Bottle conditions shelter dogs performed more social play as compared with the Crowded and Uncrowded condition. During Crowded period bottle-devices remained empty, in Crowded+Bottle feeding toys were filled with kibbles. In the Uncrowded period, 10 dogs were left in each corral and bottles-toys remained empty. In the Uncrowded+Bottle 10 dogs were left in each corral and bottles-toys were filled with kibbles. Bars not connected by same letter are significantly different (p <0.05).

5. Discussion

The goal of the present study was to determine whether the use of a home-made feeding device was able to modify the behavior of group-housed dogs. Our results indicate that as consequence of the use of the home-made device, the group-housed dogs increased the frequency of social play (Figure 2) and decreased the frequency of fights (Figure 3). These data indicate that this affordable and easy-to-make bottle-device is able to modify and improve the behavior of group-housed dogs in shelters, which could be extended to pets in houses and backyards.

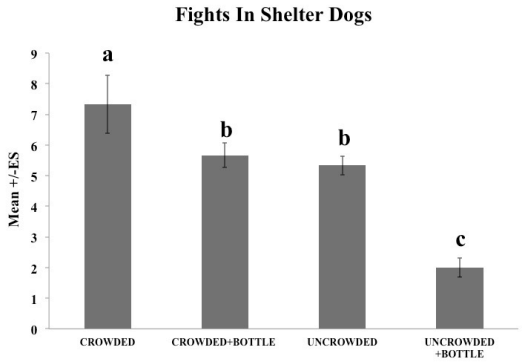

Figure 3. Mean number +/- SEM of fights episodes in group-housed shelter dogs. Both Crowded+Bottle and Uncrowded conditions were able to decrease the number of fights or interspecific aggressions in dogs as compared with Crowded condition. Interestingly, during the Uncrowded+Bottle condition, dogs significantly decreased the amount of fights as compared with the rest of periods. During Crowded period bottle-toys remained empty, in Crowded+Bottle feeding toys were filled with kibbles. In the Uncrowded period, 10 dogs were left in each corral and bottles- toys remained empty. In the Uncrowded+Bottle 10 dogs were left in each corral and bottles-toys were filled with kibbles. Bars not connected by same letter are significantly different (p <0.05).

5.1 Effects on social play behavior

Social play is commonly observed in animals that are stress-free and relaxed. Indeed, the ability to engage in social play is one of the principal indicators of welfare in both animals and humans[7-11]. Thus, an increase in the amount of social play can be considered a sign of welfare in animals. In addition, social play serves to maintain group structure and it has stress-reducing effects in animals[8-11]. In our study, group-housed dogs were more likely to play with each other during the +BOTTLE periods as compared with periods

in which the bottle-devices remained empty (Figure 2). These data indicate that the use of our home-made device may reduce the stress and improve the perception of welfare in group- housed dogs.

5.2 Effects on fights

Fights or interspecific aggression is the most common behavioral problem in dogs[12]. Fights in group-housed dogs are a serious management issue for owners and animal shelters[13]. Social and spatial restrictions increase the incidence of behavioral disorders such as repetitive behaviors, excessive barking and aggression in dogs[14]. In order to prevent fights owners and shelters tend to single house their dogs and attempt to rehabilitate them with behavior modification treatments[12,13,15]. Nonetheless, treatments have been moderately successful both in clinical practice and in shelters. In our study, dogs displayed fights even though they enjoyed areas larger than the minimum recommended (2.14 >1.11m^2). Nevertheless, with the addition of the home-made device we observed less fights as compared with the Crowded condition. The same effect was observed when the space for each animal increased to 3m^2 (Uncrowded periods). These data indicate that the use of our home-made bottle-device can decrease the negative consequences of spatial restrictions and as a result fights are also reduced. Interestingly, when the use of the bottle-device was evaluated along with the reduction in the number of dogs per m^2 (Uncrowded+Bottle period) the amount of fights was even lower than the rest of conditions. Altogether, it indicates that the use of this feeding device is a successful strategy to reduce interspecific aggressions in group-housed dogs.

5.2.1 Group housing and fights

The Mexican law is very similar to the U.S.A. law regarding the minimum required space for shelter or laboratory dogs. In Mexico, the minimum space for medium (up to 30 kg) dogs is of 1.11m^2. In the United States the Department of Agriculture (USDA) in Animal Welfare Regulation indicates a minimum space to sit, lie, stand, turn freely and walk in a natural position and calculate it as follows: "square of the sum of the length of the dog in inches (measured from the tip of its nose to the base of its tail) plus 6 inches; then divided by 144"[16].

That is (length of dog in inches + 6)^2 = X/144 = minimum required space in square feet (ft^2). In this study, dogs were housed in a minimum of 2.14m^2 in the Crowded condition (14 dogs) and 3m^2 in the Uncrowded condition (10 dogs). Nevertheless, the amount of fights responded positively to the removal of four dogs in the groups. It indicates that an increase in the housing space may enhance the effect of a feeding device or environmental enrichment on their behavior.

5.3 Support of theory 80-20 for animal welfare

Very recently, in the so-called theory 80-20 it was suggested that animal welfare should not be understood as a constant state in which animals can stay throughout the day, but rather a state that must be fulfilled several times a day[17]. The theory 80-20 arbitrarily set this proportion for the phase of desiring and obtaining something, respectively. It implies that a good program of environmental enrichment will keep animals busy wanting something, and working out to obtaining it before they can actually enjoy it. The theory 80-20 is based on the fact that *ad libitum* access to resources is rather disadvantageous for the well being of animals since they become bored, and may show unwanted behaviors indicative of a misbalance. It suggests that animal welfare programs must avoid easy access to rewards, and provide sufficient complexity for animals to "use their brain". In the present study, we suggest that our home-made device functioned as a practical toy that triggered curiosity and a kind of complexity in which animals had to operate an object in order to get access to small rewards.

6. Conclusions

This home-made feeding bottle-device appears to be a functional, affordable and easy-to-make feeding toy for group-housed dogs around the world. The use of the filled bottles under Crowded or Uncrowded conditions helped to increase the frequency of social play and to reduce the fights in group-housed dogs. Just like humans, dogs have different temperaments and dispositions. Future studies must be designed in order to evaluate the role of gender, age and temperament on effect of environmental enrichment in group-house dogs. So far, this study offers a very first evidence of a cheap and useful strategy to cope with limitation of resources and behavioral problems in group-housed dogs.

7. Acknowledgments

The authors want to thank a postdoctoral grant to PP-R (CONACYT CVU-236463), and grant SEP-CONACYT (167773) to GAC-A. Special thanks to the society for the prevention of cruelty to Animals "Amigos de los animales, AC XALAPA" and to Itzel Diaz Ramirez and Abril Gutierrez Delfín.

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