Proceedings of the 7th International Conference on Environmental Enrichment
July 31 – August 5, 2005; © 2005

Dog-laughter: Recorded playback reduces stress related behavior in shelter dogs

Patricia Simonet*, Donna Versteeg, Dan Storie
*Animal Behavior Center, PO Box 19429, Spokane WA 99219
Spokane County Regional Animal Protection Service, 2521 N Flora Rd, Spokane WA 99216

Abstract

During play encounters dogs vocalize using at least four distinct patterns; barks, growls, whines, and a breathy pronounced forced exhalation (dog-laugh) (Simonet, 2001). Further, dog-laughs are used to initiate play. Upon hearing a dog-laugh subjects use a play-face and chase or play-bow with the individual producing the dog-laugh, whether the individual is dog or human (Simonet, 2001).

This study employs a recorded playback of the dog-laugh vocalization, investigating how this vocalization ameliorates dog stress upon entry to and duration of stay at a mid-size county animal shelter. Stress is measured by an ethogram of behaviors (including, panting, salivating, pacing, barking, cowering, lunging, play-bows, sitting, orienting, and lying down) and by recording the ambient noise level of the kennel. This experiment uses a within subjects cross-over design comparing the same dogs to themselves in two different conditions; baseline condition - no playback, and the experimental condition - playback. Dogs experienced a significant reduction of stress behaviors during dog-laugh playback. In addition, during the experimental condition dogs expressed an increase in pro-social behaviors such as, approach and lip licking (Bekoff & Allen, 1998).

This study suggests that the dog-laugh vocalization diffuses stress related behavior and initiates pro-social behavior in shelter dogs, thus potentially reducing residency time.

Introduction

Domestic dogs have been sharing the company of humans for over 100,000 years (Vila et al., 1997; Leonard et al., 2002). With this lengthy common history, dogs and humans have developed common communication signals, such as eye gaze, touch, smiling, and laughter (Simonet, 2001). In Rooney et al. (2001) humans could initiate play more reliably by whispering to their dogs than by play-bowing alone. This could possibly be due to the frequencies at which whispers are emitted. When viewed on a spectrograph, human whispers appear very much like the forced breathy exhalation (laugh) of dogs with spiked high frequencies (Simonet et al., 2001 & Simonet, 2004). Chimpanzees also emit a breathy exhalation during play and tickle without the use of vocal chords in the sound production (Gardner & Gardner, 1989). Rats emit chirping sounds when tickled (Burgdorf & Panksepp, 2001 & Panksepp, 2005).

During play encounters dogs vocalize using at least four distinct patterns; barks, growls, whines (Allen, Bekoff, & Crabtree, 1999; Bekoff & Byers, 1998; and Bekoff & Allen, 1998), and a pronounced breathy forced exhalation (dog-laugh) (Simonet et al., 2001 & Simonet, 2004). Although, most dogs will utter these four patterns of vocalization during play, only the laugh appears to be exclusively uttered during play and not during agonistic encounters (Simonet et al., 2001). Further, dog-laughs are used to initiate play. So powerful is this stimulus, that humans can initiate play with dogs by using an imitation dog-laugh without any other play signal, such as a play-bow. Upon hearing a dog-laugh subjects use a play-face and chase or play-bow with the individual producing the dog-laugh, whether the individual is dog or human.

This predictable response to the dog-laugh may be used in other venues other than home environments. For example, the dog-laugh could be used to initiate a change in behaviors of shelter animals. Shelter dogs express stress in various behaviors, such as barking, lunging, growling, panting, salivating, pacing, and avoidance (personal observation of shelter dogs). When shelter dogs express stress through overt behaviors as listed above, they tend to have longer residencies at shelters (personal observation of shelter dogs). In addition to the overt behaviors above, dogs' psychological well-being can decline as well. For example, Farouk, a Labrador mix residing at Spokane County Regional Animal Protection Service (SCRAPS), paces endlessly in his kennel. In addition to pacing, Farouk spins, and exits/enters his kennel approximately 10 times in a three-minute period. Each time he exits he spins three times then returns to his interior kennel. Farouk also steps, lies, and smears his own feces over his entire kennel. These behaviors, spinning, pacing, and the combination of his exiting to spin are stereotypies.

Stereotypies or stereotypic behaviors are a type of abnormal behavior believed to be used as a mechanism for coping with distress (McMillan, 2004; Hetts, 1991). A Stereotypy can be defined as an invariant and repetitive sequence of movements occurring at a high frequency and having no apparent

purpose or goal. Such behaviors are observed in confined domestic animals including dogs (McMillan, 2004; Hetts, 1991). Stereotypies often develop in stressful situations, which include low stimulus environments like shelters.

Sometimes stress induced stereotypies develop into Obsessive Compulsive Disorder (OCD) (Eckstein, 2004). With OCD the repetitive behaviors continue long after the initial stressors have been eliminated. Behavior modification and possible psychopharmacological agents such as fluoxetine can ameliorate OCD tendencies (Overall, 1997).

The longer Farouk is resident at the shelter the more he will exhibit these stress-induced behaviors. Farouk spends each day in isolation while he is at the shelter. Dogs are incredibly social creatures; however, Farouk is not afforded any interactions with people or other dogs as he has been deemed dangerous and awaits his owner's appeal. Farouk has been in isolation for seven months.

At municipal shelters, which are generally open admission facilities (taking in all animals regardless of adoptability or space), spending too much time at a shelter may ultimately lead to euthanasia simply to make room for more homeless pets (personal observation of shelter dogs). Improving dogs' kennel presentation through reduced stressed behavior and increased pro-social behavior may lead to reduced residency and reduced euthanasia rates at shelters across the US.

At no-kill shelters (shelters with limited admission and longer residencies) the need is even greater to reduce stress by increasing positive stimuli.

Determining whether dog-laughs reduce stress related behavior of sheltered dogs is a practical application of on going animal communication studies. Also, this further refines and defines the meaning of such signals. This study investigates how this vocalization ameliorates dog stress upon entry to and duration of stay at a mid-size county animal shelter. Stress is measured by an ethogram of behaviors including, panting, salivating, pacing, barking, cowering, lunging, play-bows, sitting, orienting, and lying down.

Literature Review

Various vocalizations have been hallmarks or markers of various phenotypic behaviors. Alarm chirps of ground squirrels mark the departure of squirrels from view. Isolation cries of social animals draw conspecifics to the crying individual. Various researchers suggest that various vocalization are also markers of emotions (behaviors) in many vertebrate species (Darwin, 1896, 1970; Heinrich & Smolker, 1998; and Burgdorf & Panksepp, 2001). Domestic dogs produce various vocalizations, garnering various responses from conspecifics. For example, the howl elicits a gathering of conspecifics to one location (Bekoff & Allen, 1998). A whimper fosters care-taking behavior from adults and siblings (Bekoff & Allen, 1998). During play encounters dogs vocalize using at least four distinct patterns; barks, growls, whines, (Bekoff & Allen, 1998) and a pronounced forced breathy exhalation through the mouth (laugh) (Simonet et al., 2001). Bekoff and Allen (1998) suggest that these vocalizations allow the animals to negotiate agreement to play.

Although, most dogs will utter these four patterns of vocalization during play, only the laugh appears to be exclusively produced during play and friendly greetings, and not during other encounters. For example, barks and growls are uttered during agonistic encounters as well as during play encounters. Further, dog-laughs are used to initiate play. Humans can initiate play with dogs by using whispers (Rooney, Bradshaw & Robinson, 2001). Rooney et al. (2001) recently reported that whispering as a play signal by humans to dogs elicited a 56% success rate when used alone. When used in combination with other more overt play signals, such as a play-bow, the success of a human-canine invitation to play was augmented significantly. Perhaps, the whisper is a close approximation to the dog-laugh. When humans whisper they produce a pronounced forced breathy exhalation through the mouth.

Dogs will often exhibit a play-face while producing the dog-laugh. In addition, dogs will add the laugh when starting chase games or to augment a play-bow. They will do this whether the individual is dog or human.

While the reports of laughter during play in non-human animals are scarce they have been reported anecdotally since before Charles Darwin wrote *Expressions of Emotions in Man and animals*. Fox (1998) reports in his book, *Concepts in ethology: animal behavior and bioethics* says, "A bright-eyed direct look is often given during friendly approach, especially during play, and it is in this eye contact pattern, combined with what is termed the play face, that we again find certain analogies with human communication. During friendly approach, especially with the intention to play, canids open the mouth slightly and pull the lips back horizontally. They often pant, and the red fox vocalizes slightly at this time." Fox goes on to say, "Van Hooff has described the same facial expression in chimpanzees, terming it the panting play face. At the same time the chimpanzee may vocalize a sound very much like laughter in man. We can say, therefore, that canids do have an ancestral, primitive antecedent of laughter as we know it *Homo sapiens*."

Burgdorf and Panksepp (2001) report that rats laugh when tickled. Simonet in 1997 reported that Asian elephants, during play, emitted quiet breathy sounds. Although, not reporting these sounds as laughter she noted that they produced these sounds during solitary play as well as social play.

Dogs too will emit the breathy exhalation both during solitary play and social play. Solitary play is when a dog is playing without a play-partner, such as when a dog animates an object by tossing it into the air. During such solitary object-play dogs vocalize the dog-laugh.

In our current study, dog-laughs are defined as a distinctly different vocalization than a whisper or pant (see Appendix A for spectrographs of dog-laugh vs. dog-pant). A recorded dog-laugh was broadcast into the shelter and the resident dogs' behaviors were recorded.

Method

Data for this experiment were collected at Spokane County Regional Animal Protection Service (SCRAPS) shelter in Spokane, Washington over a period of six weeks (six Sundays when the shelter was closed to the public). This experiment uses a within subjects cross-over design comparing the same dogs to themselves in two different conditions. One condition is no playback (baseline of behaviors), and the other is the experimental condition in which the dogs experience a recorded playback of dogs playing. The recording has only the vocalization of pronounced forced breathy exhalations (dog-laugh). The dog-laugh was captured onto Sony mini digital disk recorder using a parabolic microphone. These data were then downloaded into SoundMaker 1.0.3 (Mac version) software for playback and analysis. The experimenters broadcasted the dog-laugh into the shelter kennel area using a standard Panasonic all in one CD player and speakers. The speakers were placed approximately 12 feet off the ground on a shelf overlooking the kennels.

The ambient sound level of the shelter with fans running and no dogs was 74dB. During the playback and no dogs the ambient noise was 84dB.

One Hundred twenty subject dogs ranged from 4 months of age to 10 years of age. All dogs living at the shelter during the experiment were included. The population changed over the six week period, therefore the cross-over design of comparing dogs to themselves.

During baseline data collection, all dogs' behaviors were recorded through video recordings and observational logs for 40-minute periods, six Sunday mornings consecutively. Specifically, each dog was observed for three minutes and then the observer moved to the next dog and so on. This was repeated three times by three observers at a time. During experimental data collection, all dogs' behaviors were recorded through video recordings and observational logs for 40-minute periods, six Sunday mornings consecutively. Specifically, each dog was observed for three minutes and then the observer moved to the next dog and so on. This was repeated three times by three observers at a time. Behaviors noted were coded with an ethogram of behaviors related to typical behaviors observed in dogs (see Table 1).

The video recordings and observation logs were then viewed by two blind observers separately and coded according to written instructions and the list of codes in Table 1.

Description of Behaviors	Code
Urinate	U
Defecate	D
Approached (front of kennel)	S
Ran to back of kennel (avoided)	AS
Play-bows	PB
Play-face	PF
Paws at kennel door	PK
Sits	SP
Lies down	DP
Tail wag medium (half mast)	W1
Tail wag fast (high)	W2
Orients to recording	OR
Orients to Experimenter	OE
Orients facing away (to back of kennel)	OA
Shakes (quivers)	SH
Lunges at front of kennel	L
Bites kennel door	BK
Vocalization growl	VG
Vocalization dog-laugh	VL
Vocalization whine	VW
Vocalization bark	VB
Smell/Explore kennel	EK

Table 1. Behavioral Code List

For this experiment the matched pairs *t*-test procedures compared the two conditions for the same subjects for various behaviors and for groups of behaviors. For example, pro-social behaviors included S, PB, PF, PK, SP, DP, OR, OE, and VL. Anti-social behaviors included OA, SH, L, and VG. Barking was not listed in one or the other and was analyzed separately, as barking can be attention seeking (repetitive and monotone) or aggressive as in territorial (rapid with teeth bared). Thus barking was compared to bark and no bark and decibel levels were measured both during baseline and during the experimental conditions.

Results

The ambient noise level decreased from 120dB at the peak during baseline to 96dB at peak during playback. During both baseline and playback, exhaust fans produced 74dB. The recorded playback of dogs

laughing produced 84dB during the experimental condition. The occasional spikes to 96dB during playback were produced by a lone dog attention seeking with a brief burst of 3 repetitive barks then silence.

There is a significant difference between the baseline and the experimental conditions in several responses including S (social orienting to front of kennel), $t = -7.41$, $p = .0123$, Q (silence), $t = -7.01$, $p = .0121$, and play behaviors (play-bow - PB, dog-laugh - DL, and play face - PF), $t = -7.31$, $p = .0123$, $t = -7.11$, $p = .013$, $t = -7.41$, $p = .0123$, respectively. Also, there is a significant difference by group of social versus non-social. Social responses were significantly higher in the playback condition than in the baseline condition (for a sample, see table 2).

The young puppies (approximately 4-12 months of age) offered play-bows and dog-laugh vocalizations during the playback. Adult dogs offered responses of orienting and vocalizations of barks and dog-laughs during the playback. Dogs between 1 & 2 years of age oriented toward the sound in silence, usually wagging the tail in a medium pace back and forth at mid height. Dogs over 2 years of age oriented to the sound or the experimenter and assumed the down or sit position.

Subject	PlayBack Quiet	BaseLine Quiet	Diff	Playback S	BaseLine S	Dif	PlayBack PB	BaseLine PB	Diff	PlayBack PF	BaseLine PF	Dif
1	36	0	36	16	0	16	0	0	0	0	0	0
2	8	0	8	0	0	0	0	0	0	0	0	0
3	20	0	20	12	0	12	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	24	0	24	8	0	8	0	0	0	0	0	0
6	12	0	12	0	0	0	0	0	0	0	0	0
7	16	0	16	0	0	0	0	0	0	0	0	0
8	28	0	28	12	0	12	0	0	0	4	0	4
9	20	0	20	12	0	12	0	0	0	4	0	4
10	28	0	28	12	0	12	0	0	0	0	0	0
11	4	0	4	0	0	0	0	0	0	0	0	0
12	16	0	16	16	0	16	0	0	0	0	0	0
13	32	0	32	32	0	32	0	0	0	0	0	0
14	68	0	68	64	0	64	0	0	0	0	0	0
15	8	0	8	8	0	8	4	0	4	0	0	0
16	4	0	4	8	0	8	0	0	0	0	0	0
17	20	0	20	0	0	0	0	0	0	0	0	0
18	16	0	16	4	0	4	0	0	0	0	0	0
19	12	0	12	0	0	0	0	0	0	0	0	0
20	12	0	12	16	0	16	0	0	0	0	0	0
21	28	0	28	36	0	36	0	0	0	0	0	0
22	8	0	8	0	0	0	0	0	0	0	0	0
23	24	0	24	12	0	12	0	0	0	0	0	0
24	12	0	12	4	0	4	8	0	8	0	0	0
25	16	0	16	8	0	8	0	0	0	0	0	0
26	12	0	12	4	0	4	0	0	0	0	0	0
27	8	0	8	0	0	0	0	0	0	0	0	0
28	16	0	16	0	0	0	0	0	0	0	0	0
29	4	0	4	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	16	0	16	0	0	0	0	0	0	0	0	0
32	4	0	4	12	0	12	0	0	0	0	0	0
33	16	0	16	0	0	0	0	0	0	0	0	0
34	8	0	8	4	0	4	0	0	0	0	0	0

TABLE 2. Sample of subjects and coded behaviors

Discussion

Fox (1998) reported that perhaps dogs have an incipient laugh, the breathy exhalation used during play. This vocalization, apparently exclusive to play and friendly greetings and situations, serves a very similar purpose to the breathy exhalations produced by other animals during similar types of encounters, to reinforce the actions as play and non-hostile. This communication of non-hostility may also act as a calming signal to conspecifics as well.

This study suggests that the dog-laugh vocalization diffuses stress related behavior and initiates pro-social behavior in shelter dogs, thus potentially reducing residencies at the shelter before adoption. This

reduction of residency time can also diminish agonistic and stereotypic behaviors that so often develop in dogs residing at shelters for extended periods.

Future experiments should include measuring the actual length of residency of each dog in each condition.

References

Allen, J.J., Bekoff, M., & Crabtree, R. L. (1999). An observational study of coyote *(Canis latrans)* scent-marking and territoriality in Yellowstone National Park. *Ethology, 105,* 289-302.

Bekoff, M., & Allen, C. (1998). Intentional communication and social play: How and why animals negotiate and agree to play. In M. Bekoff & J. Byers (Eds.), *Animal play: Evolutionary, comparative, and ecological perspectives* (pp. 97-114). Cambridge: Cambridge University Press.

Bekoff, M., & Byers, J. (Eds.). (1998). *Animal play: Evolutionary, comparative, and ecological perspectives*. Cambridge: Cambridge University Press.

Burgdorf, J. & Panksepp, J. (2001). Tickling induces reward in adolescent rats, *Physiology & Behavior, 72,* 167 – 173.

Darwin, C. (1896, 1970). *Expressions of emotions in man and animals*. Chicago: University of Chicago Press.

Eckstein, R.A. (2004). Welfare, Well-being, and Pain: Obsessive Compulsive Behaviors, pp. 1127 - 1130. In Encyclopedia *of Animal Behavior*, M. Bekoff (Ed.). Westport: Greenwood Press.

Fox, M.W. (1998). *Concepts in ethology: Animal behavior and bioethics*. New York: Krieger Publishing.

Gardner, R.A., Gardner, B.T. & Van Cantfort, T. (1989). *Teaching sign language to chimpanzees*. New York: SUNY Press.

Heinrich, B., & Smolker, R. (1998). Play in common ravens *(Corvus corax)*. In M. Bekoff & J. Byers (Eds.), *Animal play: Evolutionary, comparative, and ecological perspectives* (pp. 27-44). Cambridge: Cambridge University Press.

Hetts, S. (1991). *Psychological Well-being: Conceptual issues, behavioral measures, and implications for dogs*. Veterinary Clinics of North America, 21, 369 - 387.

Leonard, J.A., Wayne, R.K., Wheeler, J., Valadez, R., Guillén, S., Vilà, C., (2002). Ancient DNA evidence for old world origin of new world dogs, *Science, 228,* 1613 – 1616.

McMillan, F.D. (2004). Welfare, Well-being, and Pain: Psychological Well-being, pp. 1133 - 1144. In Encyclopedia *of Animal Behavior*, M. Bekoff (Ed.). Westport: Greenwood Press.

Overall, K.L. (1997). Fears, Anxieties, and Stereotypies pp. 209 - 250. In *Clinical Behavioral Medicine for Small Animals*. St. Louis: Mosby.

Panksepp, J. (2005). Beyond a joke: from animal laughter to human joy? *Science, 308,* 62-63.

Rooney, N. J.; Bradshaw, J. W. S.; Robinson, I. H. (2001). Do dogs respond to play signals given by humans? *Animal Behaviour*, Vol 61(4), 715-722.

Simonet, P.R. (1997). *Environmental enrichment in captive Asian elephants: Importance of novelty*. In the published proceedings of the Third International Conference on Environmental Enrichment, Orlando, Florida.

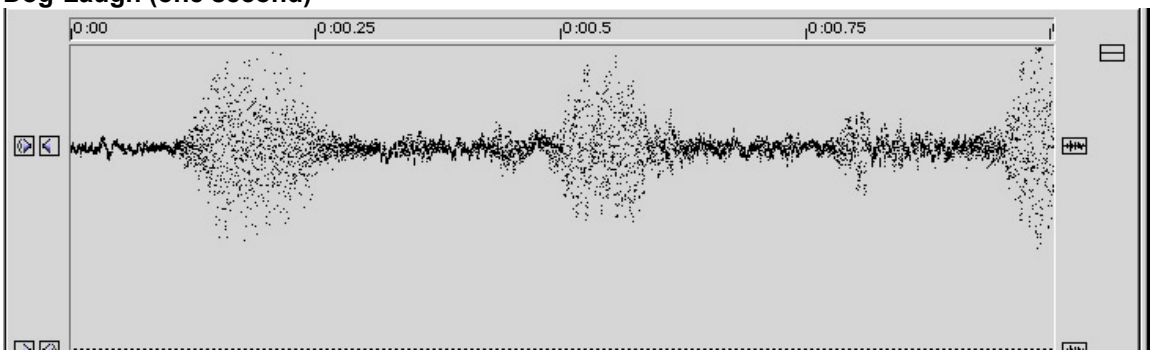
Simonet, P.R. (2004). Laughter in animals. In M. Bekoff (Ed.), *Encyclopedia of Animal Behavior*, *(vol 2)* (pp. 561 – 563. Westport: Greenwood Press.

Simonet, P.R., Murphy, M., & Lance, A. (2001, July). *Laughing dog: Vocalizations of domestic dogs during play encounters*. Paper presented at the meeting of the Animal Behavior Society, Corvallis, OR.

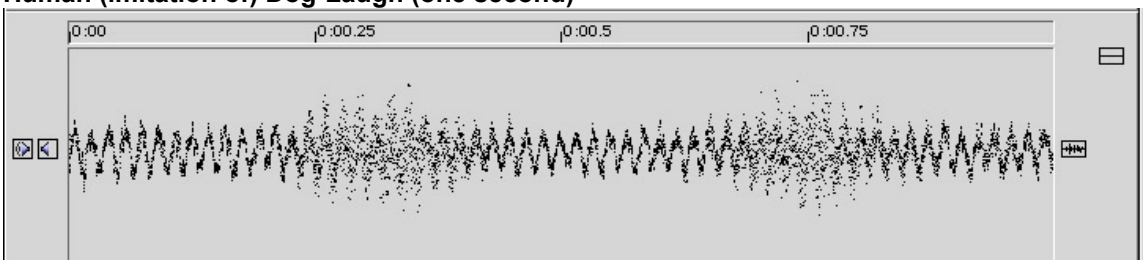
Vilà, C., Savolainen, P.,Maldonado, J.E., Amorim, I.R.,Rice, J.E., Honeycutt, R.L., Crandall, K.A., Lundeberg, J., & Wayne, R.K. (1997). Multiple and ancient origins of the domestic dog. *Science, 276,* 1687 – 1689.

Appendix A:

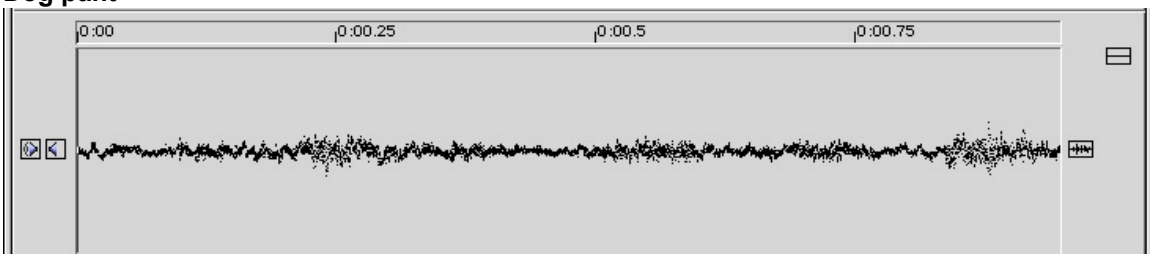
Dog-Laugh (one second)



Human (imitation of) Dog-Laugh (one second)



Dog pant



For recordings of the above spectrographs go to www.laughing-dog.org.