

Ursidae: The Undergraduate Research Journal at the University of Northern Colorado

Volume 5
Number 2 *McNair Special Issue*

Article 3

April 2019

Can Your Dog Hear You? Perceptions About Canine Hearing Loss and Noise Exposure

Nakita Jarmon

University of Northern Colorado, jarm1489@bears.unco.edu

Follow this and additional works at: <https://digscholarship.unco.edu/urj>

Part of the [Speech and Hearing Science Commons](#), and the [Speech Pathology and Audiology Commons](#)

Recommended Citation

Jarmon, Nakita (2019) "Can Your Dog Hear You? Perceptions About Canine Hearing Loss and Noise Exposure," *Ursidae: The Undergraduate Research Journal at the University of Northern Colorado*: Vol. 5 : No. 2 , Article 3.

Available at: <https://digscholarship.unco.edu/urj/vol5/iss2/3>

This Article is brought to you for free and open access by Scholarship & Creative Works @ Digital UNC. It has been accepted for inclusion in Ursidae: The Undergraduate Research Journal at the University of Northern Colorado by an authorized editor of Scholarship & Creative Works @ Digital UNC. For more information, please contact Jane.Monson@unco.edu.

Can Your Dog Hear You? Perceptions About Canine Hearing Loss and Noise Exposure

Nakita Jarmon

Mentors: Kathryn Bright, Ph.D., Audiology & Speech Language Sciences

Abstract: This research study was designed to explore dog owners' views on how often they expose their dogs to loud noises and whether or not the owners believe noise exposure affects their dogs' hearing. Many humans are not aware that dogs, too, can suffer from hearing loss. To determine dog owners' perceptions of the amount of noise exposure their dogs face and if their hearing is affected as a result, I created a survey for dog owners in Colorado. The results indicated that many dog owners do not believe they expose their dogs to loud noises. A majority of individuals were aware that noise exposure is harmful for their dog(s), but very few were interested in protecting their dogs' hearing. It is not realistic to protect dogs from all loud noises, but informing owners and limiting consistent noise exposure is what will protect a dog's hearing.

Keywords: *animal audiology, canine hearing loss, noise exposure*

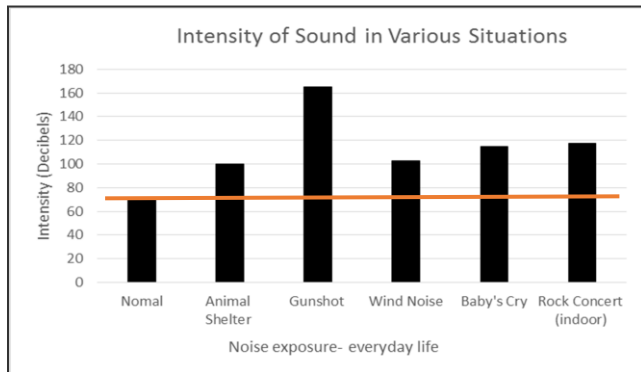
In many cases, dogs are thought of as a human's best friend, but can these relationships be affected because the dog is not able to hear as a result of being exposed to loud noises? Canine audiology is a fairly new area of study; therefore, there has been very little research conducted about canine hearing loss caused by noise exposure, which is what brought me to conduct this study. The focus of my research involved finding out dog owners' perceptions of whether or not they expose their dogs to loud noises and if these noises affect their dogs' hearing. I am interested in how educated dog owners are regarding canine hearing and hearing loss and if it is something that they have thought about. To answer my research question, I surveyed dog owners about their personal experiences and the opinions and views they have on their dogs' hearing abilities. This research is significant because humans occasionally get upset with their dogs for not listening or behaving, without considering the possibility that their dog may have experienced some hearing loss. In some cases, the assumption that a dog is "acting out" or "not behaving," can lead to abuse. Creating more awareness will hopefully decrease situations that occur where the dog(s) are at risk for abuse, as a result of a hearing loss.

Some definitions and further explanations are required to create a better understanding of

research in the field of audiology. It is important to be able to differentiate between two common measurements, dB and dBA. The Center for Hearing and Speech Language defines dB as a measurement of sound intensity over the standard threshold of hearing, which differs slightly from dBA. The dBA measurement is the sound intensity with a filter which means the filter adjusts the measurement to account for the way the ear responds to different frequencies of sound (Center for Hearing and Speech Language). A loud noise is defined as a sound that is over 70 decibels (dB) (Coppola, Enns, & Grandin, 2006). To put that into perspective, 95 dB is comparable to a subway train while you are on the platform and 120 dB is similar to a propeller air craft from 45 ft. away (Coppola et al., 2006). Any sounds 90 dB or above are considered dangerous and can not only be heard, but can be felt. There are many situations in which dogs would be exposed to loud noises that could affect their hearing. Some of these situations may include being around screaming or crying babies, going hunting with their owner who uses a gun, going to outdoor concerts, getting groomed professionally and being exposed to a blow dryer for four hours or more (Scheifele, Johnson, Bryne, Clark, Vandlik, Kretschmer, & Sonstrom, 2012), or hanging their head out of the window in a moving vehicle. All of the situations have been measured and are all above the appropriate level of 70dB. Figure 1

visually compares exactly how much louder each situation is than the appropriate loudness level.

Figure 1. Loudness levels in various situations.



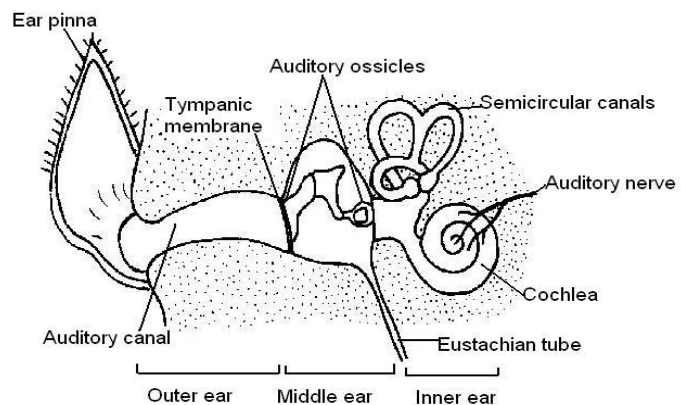
Throughout this paper I use terms such as acquired hearing loss and sensorineural hearing loss. Acquired hearing loss occurs when a dog becomes deaf after birth due to circumstances such as old age or trauma. Sensorineural hearing loss occurs when the hair cells of the cochlea are damaged by loud noises. This type of hearing loss may be caused by dysfunction of the cochlea of the inner ear, by alterations of the cochlear nerve or of portions of the auditory pathway within the central nervous system (Rak & Distl, 2005).

REVIEW OF LITERATURE

Normal Hearing in Dogs

Understanding how the auditory system works normally is important before being able to comprehend hearing loss. In a normal functioning ear, sound waves travel down the external ear canal towards the tympanic membrane which, in turn, vibrates and transmits the resulting energy via the ossicles to the fluid in the cochlea (Cox, 2002). The foot-plate of the stapes then pushes the fluid in the scala vestibuli. If the stapes moves swiftly, it sets up a complex of travelling waves within the cochlear fluids, which travel up the flexible basilar membrane and cause it to vibrate and shear the hair cells (Cox, 2002). Finally, an impulse is sent through the vestibulocochlear nerve up to the brain. The brain then has the ability to process the information that the ears just heard. Figure 2 gives a visual representation of the structure of a dog's ear.

Figure 2. Structure of the canine ear (image by Ruth Lawson, Otago Polytechnic, from https://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_The_ear.jpg)



The sensation of hearing is produced when the medium is air and pressure fluctuations fall on the ear, and the rate at which pressure fluctuations occur is called the frequency and is measured in Hertz (Hz) (Cox, 2002). Although dogs and humans have the same ear structure, their hearing abilities are different. Humans' ears are meant to be able to hear speech for communication purposes. Dogs use their hearing more for protection and it allows them to stay away from danger. With that being said, a normal adult human is sensitive to frequencies up to 23,000 Hz, while a normal adult dog is sensitive to sounds up to 45,000 Hz (Cox, 2002.) This is why canines are able to hear really high-pitched tones, and humans often use these tones as a training tool.

Presence of Hearing Loss in a Dog

Canine hearing loss is not something that is commonly thought of, and the importance of a dog's hearing is generally disregarded. Just like humans, a dog's sense of sound is very important. Noise induced hearing loss occurs when there is exposure to loud noises and increases with increased duration of exposure. The hearing loss may be temporary initially, but after extended amounts of exposure to loud noises, it can become permanent. The louder the noise, the bigger the vibrations that are sent through the ear drum to the cochlea. The intensity of the vibrations then have the ability to affect the hair cells that are in the

cochlea, by moving them. Due to the intense vibrations, the hair cells will often bend and fall over. If the hearing loss is temporary, it is because the hair cells were eventually able to stand back up, but if it is permanent, the hair cells will be damaged for good.

The ability to hear not only helps dogs with their socialization skills and makes them more pleasurable companions, but it also allows them to avoid potentially dangerous situations (Cox, 2002). It is difficult for dogs with hearing loss to localize sounds, which can have negative consequences. For example, if a dog happens to run out into the middle of the street, it might be hard for it to avoid getting hit because it will not be able to recognize exactly where the cars are. Working dogs, such as police dogs, guard dogs, or hearing dogs for the deaf, would not function sufficiently if they were faced with a hearing loss.

Hearing Loss as a Result of Being in an Animal Shelter

It has been found that if a dog is placed in an animal shelter, they are exposed to noises that are approximately 100 dB (Coppola et al., 2006). Dogs that are exposed to this environment experience 1000 times the intensity that dogs can tolerate. Barking is the main source of loud noise in an animal shelter, but the dogs are also exposed to noises such as water shooting from the hose. Although the amount of time dogs are forced to stay in an animal shelter varies, it does not take long for this type of environment and noise exposure to cause them to experience acquired hearing loss. The location in the animal shelter makes a difference on how loud the noise is. Coppola et al. (2006), found that the large adoptable area was the loudest, mostly because there were more large dogs and that area received more human traffic.

Based on personal experience, animal shelters often provide hearing protection for humans who are volunteering or are working in the facility, but it is not required for them to wear the hearing protection. While the volunteers and employees have an option to protect their hearing, the animals in the shelter do not. The concrete walls

that surround the dogs increase the intensity and loudness of the continuous barking.

Canine Hearing Loss and Frequent Blow Drying Use

One might not think of a blow dryer as being categorized as a loud noise, but Scheifele et al. (2012) demonstrated otherwise; they tested four commonly used industrial blow dryers and found that the average noise level was 94.8 to 108.0 dBA (Scheifele et al., 2012). After 4 hours of consecutive exposure to the lowest intensity blow dryer (94.8 dBA), the dog and the groomer are both in danger of having their hearing abilities affected. An average dog may not ever face this type of noise exposure, but there are some show dogs that experience this more often than others. It is a form of noise exposure that can be harmful and dog owners may want to take this into consideration. This is also something that dog groomers should take into consideration because not only is the noise exposure from the blow dryers affecting the dogs, but it is also affecting them. All four models of blow dryers that were tested showed similar sound pressure, but there were some differences in the frequency characteristics, meaning that some brands may be less damaging than others (Scheifele et al., 2012).

Dogs are a Human's Best Friend

Dog owners' relationships with their dogs can change if their dog is faced with hearing loss. Kerswell, Bennett, Butler, and Hemsworth (2009) asked dog owners to rate their ability to comprehend their puppies in each of the six emotional states. Very few participants rated themselves below average, which is good because even if their assumptions are not correct, at least they are paying attention to their dog's behaviors. Although this study helped us understand the relationships dog owners have with their dogs and validates the fact that a majority of dog owners pay attention to their dog's behavior and their emotional state, it did not include dog owners who had dogs with challenges such as hearing loss. Although there are anecdotal reports, there have not been any studies conducted on the relationship between a deaf dog or a dog that has a hearing

loss and its owners, which is why my project is so important. It is the first step in opening the realm for further research. Dogs who have a hearing loss are going to encounter difficulties communicating effectively, which may result in behavioral issues. If this is the case and the dog owner is not aware the dog has hearing loss, they may treat it as if the dog has behavioral issues, and more specifically, not listening and respecting its owner.

Some other behavioral issues that may arise as a result of having a dog that has a hearing loss may be nervousness and aggression. Klein et al. (1988) evaluated 55 dogs; 27 of them had normal behaviors and 28 of them were considered nervous dogs. In this study, they were looking for a correlation between dogs that had nervous behaviors and dogs that had a hearing loss. All of the dogs underwent a brainstem auditory evoked response (BAER) test, and were rated on a scale based on certain behaviors, such as tail wagging, playfulness, tremor, circling, etc. They were rated on the scale based on their reactions when they were alone in a room, as well as in a room with a human. Results from both the hearing test and the behavioral test were then compared to see if there was any correlation. It was found that in the normal behaving group, there was only one dog who suffered from a unilateral hearing loss, while 20 out of 27 of the nervous dogs showed no detection of a brainstem evoked response meaning that they all had a hearing loss (Klein et al., 1988). This study further validates that nervousness is a common characteristic of dogs who have hearing loss, but that does not mean that all dogs that have nervous traits have a hearing loss.

Canine Hearing Tests and Treatment for Hearing Loss

Knowing that a dog has hearing loss is difficult, but there are tools to help accurately diagnose a dog with hearing loss. The most commonly used method is the brainstem auditory evoked response (BAER), which is a test of the auditory nerve and brainstem pathways in response to sound. The sound that is presented is almost always a click. It does not require a behavioral response from the dog so dogs can be

tested while sedated or anesthetized to determine hearing status. When analyzing a BAER test, distinguishable waves on the graphical output indicates that the dog would be considered a normal hearing dog, but if no waves were present, it would be an indication of a hearing loss.

The second option one may use to determine whether or not a dog has a hearing loss is a behavioral test. A dog will pass a behavioral test if they simply turn their head to a stimulus that is presented outside of the dog's visual field. A behavioral test may help identify a hearing loss, but it does not confirm which side the hearing loss is on, where the affected area is located in the auditory system, or how severe the hearing loss is (Cox, 2002). All of this information is important to have when determining a prognosis.

If a dog acquires a sensorineural hearing loss, there is no treatment because there is no way to fix or replace the damaged hair cells, but there are ways to make the dog's quality of living better as well as the relationship between dog and owner. Some ideas include training the dog by using different signs and hand signals. Any signs and hand signals are appropriate, as long as they are being used consistently. Since the dog does not have the ability to hear, it will use its sense of sight and smell more often. Another option is getting a second dog that has normal hearing. The dog with the hearing loss will most likely follow the hearing dog, which might make it easier to train. There are hearing aids that can be used for dogs, but the process is costly and time consuming due to the amount of training that is required. Some dogs may not like having a hearing aid in their ear or anywhere close to their ear so this is not a solution for all dogs. Another option is a vibratory collar. This will allow the dog to use its sense of touch and respond when you need him or her to follow a command. Although it takes an abundant amount of noise exposure for a dog to acquire hearing loss, it is possible depending on the frequency of the loud noise exposure as well as how loud the sound actually is. There are several scenarios in which a dog can be exposed to loud noises such as being in an animal shelter for an extensive amount of

time, going hunting with an owner who uses firearms, riding in the bed of a truck or with their head hanging out of the window, being around screaming or crying children, or joining their owner at an outdoor concert.

Can Deaf Dogs or Dogs with Hearing Loss be Trained?

One might hear an occasional success story about someone who has raised a deaf or hard of hearing dog, but what about the stories where the owners are not successful? Most people are not aware of the challenges and harsh situations these dogs face. Dr. George M. Strain, a professor at the Louisiana State University School of Veterinary Medicine says that he agrees with the official policy of the Dalmatian Club of America that puppies who are bilaterally deaf should be euthanized. He also believes that all puppies that face unilateral deafness should be spayed or neutered right away so that they are not able to pass that down to their puppies. Although this is just an opinion, and the policies only apply to puppies who have congenital deafness, meaning they were born with it, some individuals may take these opinions and policies and apply them to dogs who acquire deafness because they think it is ethically and morally acceptable based on this official policy. This is where the need to increase awareness about the subject through completing my study comes in. If a dog owner knows that their dog is having behavioral issues and they can brainstorm that it could possibly be that the dog has a hearing loss, then they can take action and go get their dog tested and possibly further train him or her differently to repair some of those behavioral issues they have been dealing with.

METHOD

Participants

To conduct this research study, I surveyed current dog owners in the Colorado area through Qualtrics, an online survey tool. All participants were required to be 18 years or older. Getting a large number of participants was manageable, but getting a diverse sample was very difficult, due to the time restraint. My mentor, Dr. Kathryn Bright, distributed the link to my survey via e-mail. The

e-mail was sent to the UNC Everyone list, which includes all UNC faculty and staff. One of my professors also e-mailed the link to my classmates and posted it on Blackboard. My next source was Facebook. I sent my survey to different dog friendly pages, such as Dog Lovers International, Summit Dog Rescue, and Western Colorado Big Game Hunting Dogs, but I did not receive any responses from these sources. I posted the link to my survey on my personal Facebook page for family and friends to participate. One hundred and twenty three participants opened the survey, while an average of 100 participants completed the survey and answered every question. Although there were 100 human participants, there were 151 dogs that were reported on.

Materials

The survey that I used in my study was a survey I created on my own, with questions based on existing research about situations that can cause dogs to have hearing loss. By creating my own survey, I was able to ask very specific questions that provided me with direct answers to my research question. Another reason I decided to create my own survey was because there are not many studies done on hearing loss in dogs, meaning that finding related surveys was nearly impossible. Throughout the survey, the participants were asked questions about how often they expose their dogs to different noisy situations, and their opinions on whether or not the dogs' hearing could be affected. They then proceeded to the survey where the first ten questions were short write-in responses to questions such as, "What breed is your dog?" "Where did you get your dog from?" and so on. Following this set of questions, there were twenty frequency questions. On average, it took each participant approximately 6 minutes to complete the survey. Once they completed the survey, my contact information was provided, so that if they had any questions about my survey or results, they could contact me. The answers to the survey provided me with an indication of individuals' perceptions about whether or not loud noises can affect their dogs' hearing.

Procedures

My participants were recruited from the UNC Everyone list, which includes UNC faculty and staff, and various dog lover Facebook pages. It was also posted on my personal Facebook page, where I reached out to family and friends. Each participant was asked to complete one survey, even if they had multiple dogs. Once the participants completed the survey, my contact information was provided in case they had any questions or wanted to know more about the study. The participants were not contacted again, unless they were the winners of the gift cards.

Data Analysis

I used descriptive statistics to categorize each breed of dog that was reported, the ages of the dogs that were reported, as well as the location where each dog owner got their dog(s) from. I also used descriptive statistics to compare variables such as dog behaviors that owners observe and the frequency of noise exposure the dog faces. Another correlation that I analyzed was the dog behaviors that the owners reported and the amount of noise exposure the dogs face as well as whether or not the owner thinks the noise exposure is the cause of the behaviors. I was interested in further correlations, but because my sample size was fairly small, this was not possible.

RESULTS

One hundred participants completed my survey, reporting owning a total of 151 dogs. The dogs that were reported were very diverse in terms of age (Figure 3). Information was also given about where the owner got their dog(s) from. This information is provided in Figure 4. While 30% of the participants adopted their dog(s) from an animal rescue or an animal shelter, only 36% of these individuals knew how long their dog was in the shelter.

Figure 3. Ages of dogs reported in survey.

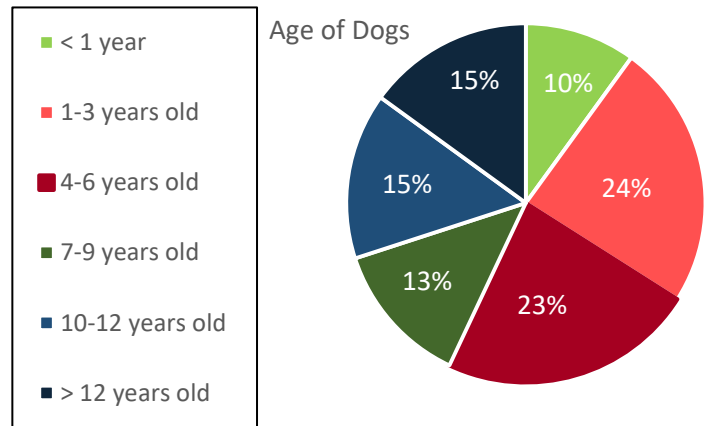
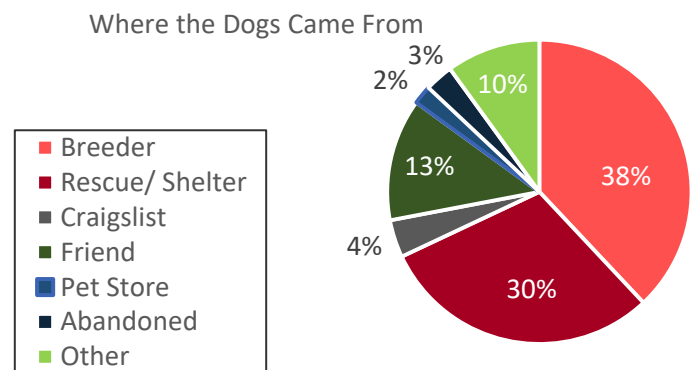
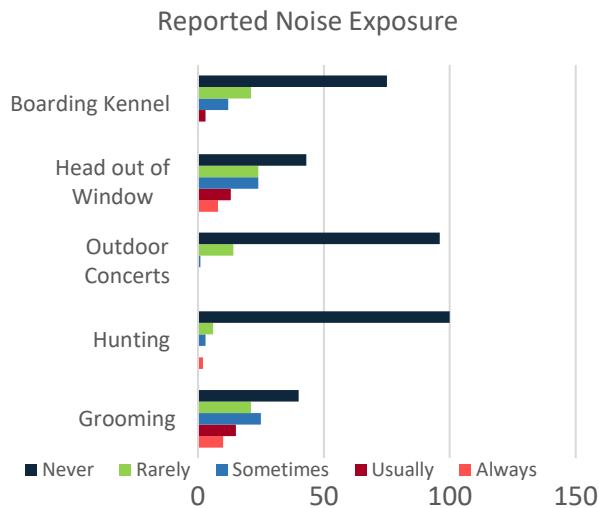


Figure 4. Location where owners got their dog(s).



When asked how many hours their dog(s) are exposed to loud noises on a daily basis, 86% of participants said 0-2 hours a day, leaving 14% who said 2 or more hours a day. I was interested in the amount of overall noise exposure dogs' face, as well as situational noise exposure that they face, such as hanging their head out of the window or being groomed with a blow dryer. To compare different noise exposure situations, I asked participants to answer how often their dog(s) are exposed to specific noisy situations on average. Figure 5 indicates each situation that was asked about, as well as the responses that were given by each participant.

Figure 5. Responses to situational questions asked about in survey.



It is clear to see that a majority of the participants reported rarely or never exposing their dogs to these situations. One situation that did show more frequent exposure was professional grooming. According to the survey, 45% of dog owners get their dog(s) groomed always, usually, or sometimes. On average, the participants reported the amount of time it takes their dog to get groomed is 2 hours, while the range was between 30 minutes and 4 hours.

There were interesting findings related to the participant's perceptions of their dog's hearing. While 98% of participants believed that exposure to loud noises is harmful for their dog(s) and 99% think that their dog(s) hearing should be protected from loud noises, 58% say they do not do anything to protect their dogs hearing.

DISCUSSION

I was hoping to have a diverse group of participants with different backgrounds, but my sample consisted mostly of the University of Northern Colorado faculty and staff. This may have altered my results. I assume that since a majority of participants were UNC faculty and staff, that they are well educated and are part of an older generation, based on their level of education. Although they may not be educated about the field of animal audiology specifically, they possibly have a better understanding of

hearing loss in general. I also believe that my approach had some flaws and may have created bias. Throughout my survey, I asked questions such as "Do you believe exposure to loud noises is harmful for your dog?" After reading similar questions, participants may have begun to infer that noise exposure is harmful for their dog, because if it was not, these questions would not have been asked.

A majority of my participants reported that they believe loud noises are harmful for their dogs, which coincides with the 85% of participants who expose their dogs to loud noises 0-2 hours a day. I believe that this question may have many truths to it, considering each person has a different definition for a "loud noise." I am interested in why this is the case though. Are dog owners not exposing their dogs to these noisy situations because they know they are harmful, or because these are not situations they encounter frequently. One limitation of this study was the types of situations that were asked about in the survey. I believe adding more situations that individuals encounter on a daily basis such as watching TV while their dog is laying on the couch next to them or being around other dogs who are barking, would be beneficial. I believe dog owners would find these situations more illustrative of their personal experience. I believe conducting follow up interviews with some of the participants would have provided more detailed information about dog owners' perceptions. Including interviews would be an important part of conducting future research on this topic. Another consideration that would make the responses more clear, would be to have the participants take a survey for each dog that they own, instead of grouping them together.

Due to the amount of individuals who take their dog(s) to get professionally groomed versus any other noisy situation, more education in the grooming salons should be provided for the owners. After analyzing the results, it seems as if dog owners who get their dogs groomed are unaware of the repercussions that their dog may face depending on the amount of time that is spent on their dog being groomed. I would be interested

in finding out specifically what dog owners think about the noise exposure that comes with professional grooming and the effects it could have on their dog.

Not only are most dog owners unaware of their dogs' hearing abilities or lack of, but they are unaware of the signs and behaviors that might come along with it. Throughout the survey, some participants reported behaviors that they thought may be related to hearing loss, such as food aggression, beginning to urinate in places that aren't normal, being rambunctious and continuous need to dominate older dogs. I do not believe any of these behavioral issues directly correlate with hearing loss. According to American Society for the Prevention of Cruelty to Animals, if a dog is deaf or has hearing damage the signs to look for would be if your dog seems depressed or emotionally different than usual, if your dog does not know you are in the room until you are close to it, if it barks excessively, and if the dog does not respond to verbal commands. Some of these signs may be tricky to identify because they can also be signs of a dog who has not been trained well, which is why awareness of the topic is important. Dog owner's need to know that if their dog is not listening, it may be because they just came from a shelter and they have never been trained or it can be because they have hearing damage and simply cannot hear.

A future study that would provide a lot of insight for the field of audiology would be an ongoing study. There would be a small sample size of approximately 5-10 dogs who would get their hearing tested through the BAER test. The canine participants would then go on with their normal lives, while their owners would record daily the amount of noise they are exposed to and what types of noise exposure they have encountered. The canine participants would then be tested again for a post test. We would be able to compare their actual hearing levels with the reported amounts and types of exposure they have encountered over the year.

CONCLUSION

Through conducting my study and sharing my findings with others, I hope that I have and will continue to educate individuals on the damages that can be done to a dog's hearing if exposed to excessive amounts of loud noises. My goal is to continue to create awareness about hearing loss and prevention. I think dog owners will benefit greatly by gaining a simple understanding of the loud noises they subject their dogs to, the effects those noises can have, and how to eliminate or minimize some of those noises if at all possible.

REFERENCES

- Coppola C., Enns M., & Grandin T., (2006). Noise in the animal shelter environment: Building design and the effects of daily noise exposure. *Journal of Applied Animal Welfare Science: JAAWS* 9(1), 1-7. doi:10.1207/s15327604jaws0901_
- Cox C., (2002). Investigation of hearing loss in dogs. *In Practice*, 24, 494-501. doi:10.1136/inpract.24.9.494
- Kerswell K., Bennett P., Butker K., & Hemsworth P. (2009). Self-reported comprehension ratings of dog behavior by puppy owners. *Anthrozoos*, 22, 183-193. doi: 10.27752/175303709X434202
- Klein E., Steinberg S., Weiss S., Matthews D., Uhde T., (1988). The relationship between genetic deafness and fear-related behaviors in nervous pointer dogs. *Physiology & Behavior*, 43, 307-312.
- Rak S., Distl O., (2005). Congenital sensorineural deafness in dogs: a molecular genetic approach toward unravelling the responsible genes. *The Veterinary Journal*, 169, 188-196. doi:10.1016/j.tvjl.2004.01.015
- Scheifele P., Johnson M., Byrne D., Clark J., Vandlik A., Kretschmer L., Sonstrom K., (2012). Noise impacts from professional dog grooming forced-air dryers. *Noise & Health*, 14, 224-226. 10.4103/1463-1741.102958
- Strain, G., (1996). Aetiology, prevalence and diagnosis of deafness in dogs and cats. *British Veterinary Journal*, 152 (1), 17-36.