A CASE STUDY ON THE EFFECT OF MUSIC

IN MANAGING CHRONIC STRESS IN DOGS

by

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IN MANAGING CHRONIC STRESS IN DOGS

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ABSTRACT

Several studies have shown the positive behavioral and physiological effects of music on dogs in kennels and other acutely stressful situations, but there is little research on whether similar effects can come from playing music for chronically stressed dogs. This study attempted to prime this area by taking a case study approach on music's effects on dogs with cognitive dysfunction syndrome (CDS) (which is shown to cause anxiety and is an uncurable and long-term condition). Additionally, this study attempted to introduce music therapy ideas to CDS treatment, since music therapy is known to assist humans through psychological stress as well as many other ailments. The case study portion of this study focused on a single geriatric dog suspected to have CDS, for which a short pre-test post-test design was used to assess how exposure to music affected them throughout the music treatment window and after cessation. This was done in situ (in the subject's house) to minimize any stressors other than CDS. While identifying potential subjects, information on another dog was received that helped demonstrate the social dynamics in the household of dogs with CDS. Ultimately, there seemed to be some reduction in repetitive behaviors due to musical enrichment (as well as social enrichment), but other behaviors seemed to worsen. Due to the low number of subjects in this study, the time constraints of working with near-end-of-life dogs, and the inability to maintain constants in an in-situ environment, this study has little statistical power in determining the efficacy of music in reducing chronic stress in dogs with CDS. However, this study was able to provide starting points for future research in: 1) chronic stress reduction in dogs through music, 2) a more encompassing music therapy-based approach to animal welfare, and 3) the social dynamics in the household of a dog with CDS.

<u>INTRODUCTION</u>

With increasing concerns about animal welfare, especially for companion animals, there has been a focus on the impacts of stress in captive and domestic animals, including dogs. Stress has been shown to cause many health issues in dogs, and stress reduction has been shown to increase their well-being (Hennessy et al., 2020). Researchers have approached this issue by playing music for dogs in stressful environments, especially kennels and shelters. Such studies showed that music reduced stress among kenneled dogs while it was being played, but there was little residual stress reduction after the music treatment was stopped (Bowman et al., 2015; Brayley & Montrose, 2016, not the primary finding). The loud and busy kennels that these studies focus on are an example of acute, external stress, because it is a temporary stimulus that the dogs can be removed from. Music has also been shown to condition a positive response in dogs and reduce behavioral stress from separation (Bernardini & Niccolini, 2015).

This study was consistent with previous research in exploring the reduction of stress using a music protocol. However, the literature is lacking in research investigating music as a treatment helpful for reducing chronic stress caused by an internal source, such as an illness. This study was designed to explore this niche. Whereas previous studies took place in kennels (an external stressor), this study took place in the homes of companion dogs in order to produce the most accurate results – their home is where surroundings are most comfortable and familiar to the dog and their human caretaker, so it minimizes external stressors. Geriatric dogs can often experience chronic stress due to their declining health. Their stressors come from internal sources, and they cannot be removed. A common example of this occurs with Cognitive Dysfunction Syndrome.

Cognitive Dysfunction Syndrome

Canine Cognitive Dysfunction Syndrome (CDS) is a natural model of Alzheimer's Disease in humans and is therefore similar in pathological cause and clinical symptoms. As such, it is progressive and incurable. Pathologically, it is caused from the buildup of β-Amyloid plaques in the central nervous system among other causes. The most common symptoms include sleeping during the day and restless at night, decreased interaction, disorientation at home, and anxiety (Fast et al., 2013). These symptoms are often separated into six categories, collectively known as DISHAA (Disorientation, Social Interactions, Sleep/Wake Cycles, Housesoiling/Learning and Memory, Activity, and Anxiety). CDS is more common in older dogs; Neilson et al. (2001) found impairments in at least one of these categories in 28% in dogs 11 to 12 years old, and impairments in at least one of these categories in 68% in dogs 15 to 16 years old. CDS can only be diagnosed by ruling out other possibilities such as brain tumors (via MRI) and other conditions that can exacerbate CDS symptoms. Several behavioral assessments have been made to assist diagnosis of CDS, most prominently CADES (the Canine Dementia Scale) and CCDR (the Canine Cognitive Dysfunction Rating Scale); such assessments can be used to monitor changes in the severity of CDS (Madari et al., 2015). Several physiological markers are also indicative of CDS including "slightly elevated liver enzyme parameters (AST and ALT) and significantly decreased sodium and chloride levels in blood serum" and an "increase of neurofilament light chain (NFL) in blood serum" (Vikartovska et al., 2021). CDS is incurable and its progression cannot be stopped, but it can be slowed and treatments exist to reduce symptoms including several medications to help reduce anxiety. Studies have also shown that CDS onset can be delayed and symptoms can be reduced by maintaining a healthful diet including certain nutrient supplementation as well as maintaining a physically active lifestyle and

healthy body weight (Pan et al., 2018; Yarborough et al., 2022). Due to the relatively under-researched state of CDS, the public's general unfamiliarity with CDS, the fact that most dogs with CDS remain undiagnosed, and that most dogs with CDS have a limited remaining life span, it is difficult to find a large local sample of dogs with CDS in the general population and to intensively work with them for an extended period of time.

Music Therapy Approaches

Music has been known to have various positive effects on people, and it was employed for such purposes since the earliest civilizations. This relationship was formally recognized and categorized as music therapy in the late 18th century and has been more thoroughly explored since then (Darrow, 2008). One of the many uses of music therapy in humans has been to reduce stress. This study's treatment variable and goals overlap with studies that use music therapy to treat human subjects for a variety of issues, including stress and anxiety. This study aims to bridge human and non-human music therapy research. Music therapy is not to be confused with music medicine; music therapy involves its participants' active involvement or comprehension, whereas music medicine is merely playing music for an individual. In both approaches, music is always prescribed based on the specific needs of an individual in their given situation.

Aims

The aims of this study were to: 1) assess whether music can reduce chronic stress in dogs, particularly those suspected to have Cognitive Dysfunction Syndrome; 2) apply knowledge of human music therapy to canine stress reduction; 3) assess whether a course of music treatment can be used to reduce stress within an environment familiar to canine subjects (i.e., their home); 4) provide starting points for future research on the topic; and 5) further answer whether pet

owners can use music to calm their companion animals, especially those with stress induced by illnesses.

METHODS

Selection of Study Subjects

This research was conducted with the assistance of a veterinarian who identified possible research subjects (canines with CDS). Dogs' human companions were asked if they would like to have their dog participate in the study. Before inclusion in the study, the investigators discussed each dog's condition with their owners to determine the similarity between their condition and Cognitive Dysfunction Syndrome and determine whether they were eligible for the study. Standard bloodwork on the subjects was recommended to determine their health status and potential underlying conditions that would make them unsuitable for the study, but the decision to pursue this was left to the owner. Blood work is typically done as part of the normal care by most veterinarians and the information was requested from owners if it was available. Due to the difficulties that CDS has on the accessibility and life span of subjects as mentioned earlier, this study hoped to study the impact of music treatment on two to three dogs during. However, research was impeded even more than expected due to the decline of the health of some dogs identified early for the study and then later one dog's owner decided to not participate in the study due to changes in her household composition.

Study Structure

In the early stages of this research, the researcher aimed to employ a qualitative case study method and if multiple dogs were identified and included in the study quasi-experimental design would be implemented known as one-group pre-test post-test. A one-group pre-test post-

test- design measures a dependent variable (CDS symptoms/stress symptoms) before and after one group is exposed to a treatment variable (music). Quasi-experimental designs are patterned similarly to classic experiments, but the conditions for participants are not strictly controlled and study participants are not randomly assigned. Additionally, there is no ability to control environmental factors and no control/comparison group. Thus, quasi-experimental designs are typically used for exploratory research because they do not provide sufficient power or control to produce generalizable results. However, these designs are very helpful for investigating real-life conditions and exploring variables that might be of importance for future research where greater control can be achieved. These methods tend to be useful as inductive tools in the research process. (Privitera & Ahlgrim-Delzell, 2019). Due to only two subjects volunteering to participate, and one volunteer withdrawing early in the study, this research had to rely only on case study methodology and an informal interview with the human companion of the dog that was with withdrawn from the study.

Case study methodology is a tool that can be used to study complex behavioral phenomena in context. It is a valuable approach for beginning a body of knowledge in an emerging area of study and/or gathering data in context for rare or difficult to capture phenomena. Case study methods are useful for theory generation, evaluation of programs or therapies, and development of possible interventions (Baxter and Jack, 2008).

Case study approaches are important tools are useful to employ when researchers would like to 1) explore the underlying dynamics of a phenomenon; 2) study a behavior that cannot be manipulated directly in the study; and/or 3) explore the contextual conditions of a behavior (in situ) (Baxter and Jack, 2008). In the case of this research, the social dynamics of CDS in situ are complicated and understudied; companion dogs with CDS are fragile subjects, and it is not

desirable to manipulate them in ways that would conform to strict experimental designs, and the effectiveness of treatments in situ are complex and specific to individuals.

Collection of Data

The primary source of data for this research was derived from reported observations on the canine subject by their human-companion using a daily behavioral assessment that was self-reported by the human companions of the dog. This assessment was adapted from the DISHAA assessment tool made by Purina (Landsberg, 2017). See Appendix A. Additionally, the dog's human companion provided the subjects' history with music and general information about his health and behavior in a pre-study questionnaire. See Appendix B. For the purposes of this study, we will identify this study subject by the pseudonym, Max. Charlie is the pseudonym for the dog who was withdrawn from the study.

As discussed previously, the music treatment took place in the home of Max and was administered by his human companion. The case study is divided into three phases – pre-music treatment, music treatment, and post-music treatment,

Pre-Music Treatment Phase: On days 1 and 2 of the study, no music was played, and a behavioral report was filled out by the human-companion each day. This 2-day period served to obtain baseline data on the subject's behavior before music treatment intervention was used.

Music Treatment Phase: On days 3 through 7 of the study, music was played, and a behavioral report was filled out each day. This before and after data shows if any change occurred due to the treatment.

Post-Music Treatment Phase: On days 8 and 9, no music was played, and a behavioral report was filled out each day. This data was used to assess if any effects of the music treatment or stress symptoms subsided after cessation of the treatment.

Equipment and Parameters

Because dogs have sensitive hearing, the research called for deliberate attention to aspects of quality and volume of the music to be used in the Music-Treatment Phase. The speaker provided for the study was the JBL Flip 6 Bluetooth speaker. The volume was set to 8 clicks of the "+" button after muted, which allowed the music be roughly 50 dB, a safe volume for dogs. It is generally believed that hearing loss occurs past 70 dB. Human companions were asked to set the speakers in a centralized location where the subjects could hear the music at all times during the treatment.

The music used during the treatment phase was the Spotify playlist, "Beautiful, Calming Classical Music" by Jared Kuo (2 hours and 26 minutes of music in the classical genre known for a calming impact on humans). The music was played with shuffle turned on and repeats allowed. All of the music in this playlist is instrumental, relatively slow, and with no sudden loud moments. The human companion confirmed that that she played the music as suggested, for at least 1 hour each treatment day.

Limitations

Due to the difficulty with finding subjects, this study was limited to the case study approach as without multiple cases the researcher was unable to employ the quasi-experimental design. Case studies are limited due to the very small number of subjects which gives the study little statistical power or generalizability. Also, the study was relatively short in duration, only 9 days, especially for observing a chronic illness. The treatment was limited in scope as well because subjects were only observed for a small portion of the day. There are also some limitations with the behavioral assessment instrument utilized for this study; it did not weight the significance of symptoms in terms of their impact on the dog's quality of life, so different

behavioral displays of stress have equal significance here. Further, there is no analysis of specific responses to specific music type or musical elements used in the study. The quantitative recording of and breakdown of behavioral data is relatively simplistic and qualitative. Lastly, there is an absence of physiological data, including cortisol (which was originally planned but unable to be tested), heart rate, and body temperature. Most of these limitations were caused by subject availability and time, which can be addressed with future research.

Ethics

This study and its investigators were approved by TCU Research Compliance as Protocol 2022-13. The principal investigator and supervising professor participated in required basic course training through the Collaborative Institutional Training Initiative (CITI) program and received certification from TCU Research Compliance. The investigators searched databases ProQuest and PubMed to make sure this study is not an unnecessary duplication of other research, to ensure the goals of reduction of use and harm and minimizing repetition were met with this research as these are central ethical goal for all scientific research. Max's human companion completed a consent form, allowing his information and data collected from him to be used in this thesis. See Appendix C. Charlie's owner gave verbal consent for the information they shared during the informal interview to be used in this thesis.

<div align="center">RESULTS</div>

Preliminary Implications

In the initial scope of the study, the goal was to have two to three subjects, but due to lack of owner consent and willingness to complete the study protocols, as well as subject attrition, only one subject, Max, completed the treatment protocol. A second subject, Charlie, was

identified for the study; his human companion initially agreed to have him participate in the study but later dropped out of it. Charlie's human companion did discuss at length her reasons for dropping out of the study. There were interesting developments and some qualitative information was shared with the researchers, which are reported below. During the identification and search process, both human companions shared their previous CDS-related observations of their dogs with the researcher, which is reported below.

Due to difficulties with timeliness and distance to transport urine samples to the consulting veterinarian's office for analysis, data on urinary cortisol could not be collected for this research as originally hoped. Therefore, no biological data were collected for this study.

Case 1 – Max

Subject information and history with CDS and music exposure

Max is a 14-year-old, mixed breed (including Black Labrador Retriever and Blue Heeler) dog. He lives with three human companions and another dog. He has reportedly exhibited CDS symptoms for the past two to three years – full information on his symptoms were reported in the pre-survey by his human companion and additional symptoms were written in on the behavioral assessment forms. His human companion described his most notable symptoms as increased attachment and compulsiveness.

Max is considered to like music. Both of his adult human companions are professional musicians; at the house, he hears the French horn daily and a rock band every few months, both of which he is unbothered by. His human companions sing frequently and listen to music over speakers daily which includes classical, rock, country, pop, and electronic genres. They also watch television around him daily which includes the news, YouTube videos, and Netflix. He has never been to a live concert.

Behavioral Assessment Data

        After completing the study, the completed daily behavioral assessments were reviewed and compiled into Table 1. The total score for each day was then added up and compiled into Table 2. Graph 1 shows the trends for each behavior throughout the week, and Graph 2 shows the trend of the total score for each day.

        Max's human companion reported that his behaviors seemed to get worse as the music continued on some behaviors, contrary to what we expected. They were particularly surprised about his indoor soiling of urine/stool. There were no significant events in the house during the study such as visitors to the house, loud noises, or excessive activity, but the human companion did report abruptly changing his diet on day 7 (bolded in Table 1 and Table 2) and that the old food was not as nutritious as the new one. The old food was Purina ONE Natural SmartBlend Chicken & Rice Formula (kibble), which he had been on for about one month prior, and the new food was Pedigree Complete Nutrition Roasted Chicken, Rice & Vegetable Flavor (kibble). Max reportedly returned to normal on day 8 and none of the negative behaviors remained. Also, vocalizations during the day stared high and became moderate and remained so through the study. Aimless pacing, getting stuck and staring blankly all worsened in level of intensity during the study. The only distinctly positive result that was reported was that Max began licking/chewing less, and this continued at least two weeks past the end of the study.

Table 1. Intensity of Max's observed CDS-related behaviors. Red numbers mean that behavior was repetitive. Raw data from daily behavioral assessments. Day 7 is bolded since Max's diet was changed then.

| Day	1	2	3	4	5	6	7	8	9
Date 2022	11/18	11/19	11/20	11/21	11/22	11/23	**11/24**	11/25	11/26
Music Treatment			2:15pm-7pm	1 hour	12:45pm-3:30pm	>1 hour	**2 hours**		
Gets stuck, difficulty getting around objects, goes to hinge side of door		4 (laid on top of human companion on couch twice)			5		**5**		
Stares blankly at wall, floor, or into space	1	2		2	3	5	**6**		5
Gets lost in home or yard						3	**5**		
Less reactive to visual or auditory stimuli							**3**	3	
Responsive to dogs walking by	7		3						
Extra clingy					5				
Pacing/restless/ sleeps less/ walking during night							**3**	6	6
Pacing/restless/ sleeps less during day							**3**		
Vocalization at night								3	5
Vocalizations during day	7 (Dinner, dogs walking by)	3		3	4		**3**	3	
Indoor soiling of urine/stool or decreased signaling to go out				2	4	5	**5**		
Distracted/decreased focus					4				
Aimless pacing or wandering		3		3	4	4	**5**	6	5
Repetitive chewing, licking	8	7	6	5	3				
Reactive to visual stimuli	5	5	3	4					
Particular improvements	N/A	N/A	none	none	improved licking/ chewing (2/10)	improved licking/ chewing (6/10)	**none**	N/A	improved licking/ chewing (5/10)

Table 2. Total score for each day. This is found by adding the score of each observation for the day. Day 7 is bolded because Max's diet was changed then.

Day	1	2	3	4	5	6	7	8	9
Date	11/18	11/19	11/20	11/21	11/22	11/23	**11/24**	11/25	11/26
Total	28	24	12	19	32	17	**38**	21	21

Graph 1. Trends for each behavior.
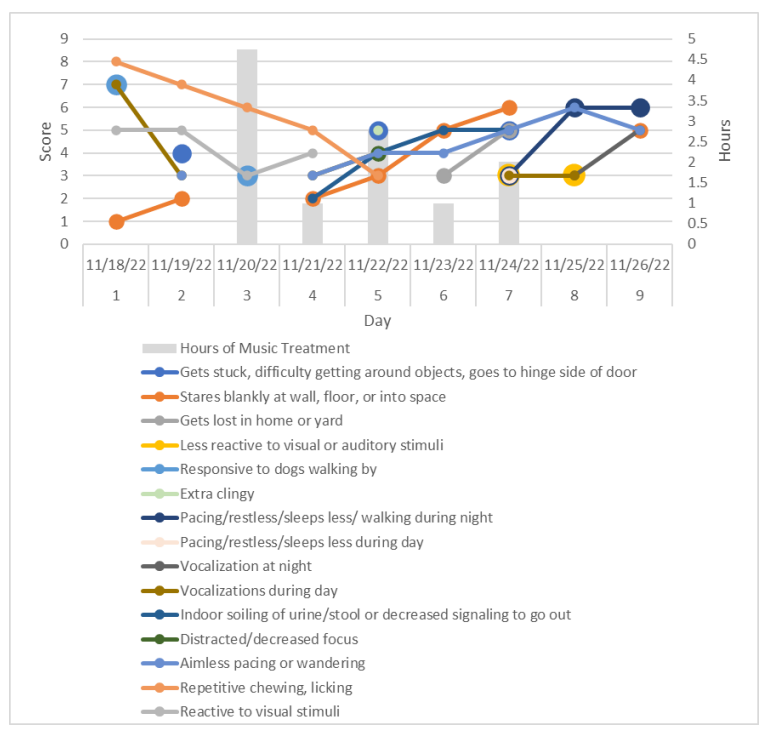
Graph 2. Trend for daily total score.
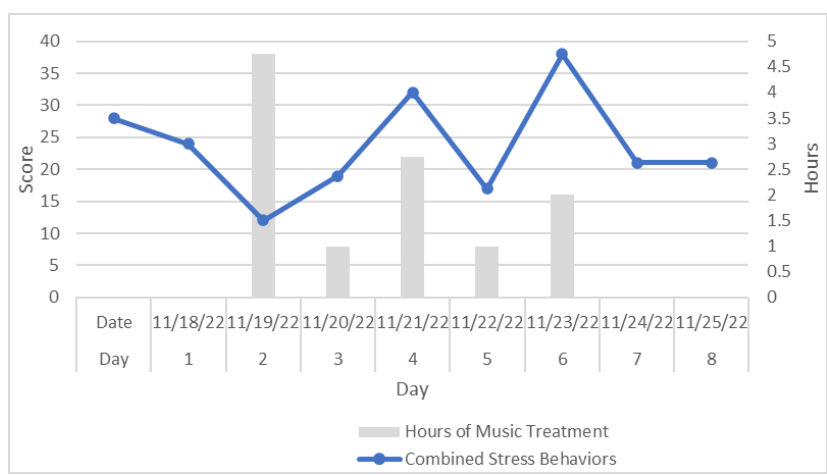
Case 2 – Charlie

A pug with CDS. In the early stage of the research, Charlie's human companion revealed that much had changed in her household and that newly emerged time limitations and caretaking responsibilities, meant that she could not consent to do the behavioral assessments which were

core to the study. In a follow-up phone conversation to determine what aspects of the study that she and Charlie might be able to participate in, she reported that her new time commitments were the result of her family adopting a new puppy, another pug, who was high energy. She also revealed that she was now caring for a grandchild and would not be able to take the time needed for any part of the study. She did consent to the follow-up phone conversation being included in the study and agreed happily to answer some additional questions about how Charlie was doing now with the changes in the household and his health generally. Interestingly, she reported that she had waited and resisted getting another dog for a while because of fear that it would negatively impact Charlie. However, an opportunity arose to get a puppy and they relented and did so. To her surprise, she reported that Charlie's symptoms of listlessness, bouts of repetitive barking, and being disinterested in play had gotten better. The new puppy would lay with him and tried to play with Charlie from time to time. She said that Charlie had perked up, was barking much less and had would play a bit with the new pug. Her feeling was that getting the dog helped Charlie, and she regretted not getting a puppy sooner now that she knew he might have enjoyed having a friend.

Serendipitous Findings and Researcher Reflections

For both cases, there were findings that were not the result of the planned study, but nevertheless these became highly important to report due to their salience for any future studies that attempt to study aging and ill canine companions. First, some of the most important findings came as a result of informal conversations with Max and Charlie's human caretakers. In Max's case, his caretaker not only wrote additional symptoms on her daily assessments, she was keen to discuss some of the symptoms, both those listed in the behavioral assessment form and others, that worsened temporarily over the course of the treatment. She pondered explanations for the

symptoms and felt might have been normal decline, or a change in his food. She said she did not think the music had made these symptoms worse. One unanticipated research takeaway in this case was that this human companion's deep concern about, and constant monitoring of, her dog's health is likely typical of canine companion caretakers who are deeply attached to their dog, are empathetic and managing the impending loss of their beloved pet. It is difficult to understand what an animal companion is feeling and experiencing even when they are healthy. When they are ill, humans seem to be even more challenged in coming to an acceptable understanding.

Second, the emotional stress for all involved when attempting to work with these vulnerable dogs is high. For example, in the recruiting stage of the research, when I was working with the consulting veterinarian dogs would be identified as possible subjects, but in the time it took to go through the necessary bureaucratic aspects of getting approvals and securing funding, dogs that would have been included in the study had died. While I did not know the dogs personally, the reality of the certain death of aging dogs was foremost in the minds of those working on this project. Also, it became clear that for humans who were already taxed by the increased caregiving stress of having a dog with CDS, doing this extra work was daunting.

DISCUSSION AND CONCLUSION

This research has shown that there is hope that music therapy may provide a calming effect on licking and repetitive behaviors in dogs with CDS, but the study's findings are not generalizable. Further, this study was not able to demonstrate that music therapy helped with any of the other symptoms associated with CDS. Clearly the greatest limitation of this research was the inability to locate and include dogs with CDS in the study. This was primarily due to the time constraints produced by studying geriatric dogs, many of whom are near the end of their lifespan.

Research has shown that the average survival time from the time of diagnosis to death is not easy to predict due to a host of factors including. However, most dogs are diagnosed with CDS are usually in the last few years of their life span (Fast, Schütt, Toft, Møller, & Berendt, 2013). Not all cases of CDS progress the same way, and if dogs are diagnosed in the early stages of cognitive decline, then they can benefit greatly from medication and behavioral therapies (Yarborough, Fitzpatrick, Schwartz, 2022).

There were also unintended findings with this study. First, it became clear that human caregivers themselves suffer from fatigue, demonstrate physical responses to stress due to seeing their companion dog in decline. Many human caregivers of CDS dogs, like their dogs, demonstrate emotional symptoms of stress as well, including depression, grief, anxiety, anger, social isolation, sleepless nights, and hyper-awareness of changes. Caretaking of dogs with CDS can lead to fatigue and mental exhaustion. Caretakers are also concerned about the impending loss of their loved companion. In additionally, the human responsible for the elder dog also has the added responsibility of making that difficult decision about when to euthanize their beloved companion animal. The robustness of this research could be increased in multiple ways in response to the limitations of this study. These improvements include: increased number of subjects, increased length of study period to be able to capture dogs in the study who are at early stages of CDS, increased observation period, analysis of specific response to music and musical elements, more quantitative recording of and breakdown of behavioral data, including physiological data including cortisol, heart rate, body temperature, and a larger budget to make these improvements.

While this study has begun to bridge the gap between human music therapy and animal stress reduction, it will be important for future studies to create music therapy programs for

canines with CDS and other stress related behaviors. Toward this end, the goals and utility of music therapy should be considered and followed more closely by veterinary researchers. This would include methods like training/conditioning dogs with musical exercises rather than simply playing music for them, which is actually music medicine.

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST

FUNDING

APPENDICES

Appendix A. Daily Behavioral Assessment

Behavioral and Cognitive Assessment Survey

The following survey tool will assist in monitoring behavioral and cognitive symptoms associated with aging dogs who might benefit from experimental music therapy for treating Cognitive Dysfunction Syndrome. There are also items that relate to any improvements in behavior or cognition that result from music therapy sessions. If anything happened in the past day that you think affects your dog's symptoms, make note of it and attach it to this form.

Dog's Name: _____   Date_____

Number of Hours Played Music for Dog:_____

DAY OF STUDY (Days 1-9): _____

BEHAVIORAL/COGNITIVE SYMPTOMS/BEHAVIORS	Check ✔ any symptoms or behaviors that were observed in 24-hour period	Score degree of symptom or behavior 1-10 1 = very *mild* to 10 = very *strong*	Were symptoms or behaviors repetitive Yes/No
DISORIENTATION			
Gets stuck, difficulty getting around objects, goes to hinge side of door			
Stares blankly at walls, floor, or into space			
Does not recognize familiar people/familiar pets			
Gets lost in home or yard			
Less reactive to visual (sights) or auditory (sounds) stimuli			
SOCIAL INTERACTIONS			
Irritable or fearful with people or other animals			
Fearful in being approached, greeted, or receiving affection/petting			
SLEEP/WAKE CYCLES			
Pacing/restless/sleeps less/waking during night			
Pacing/restless/sleeps less during day			
Vocalization at night			

Vocalizations during the day			
EATING, HOUSE TRAINING, LEARNING AND MEMORY			
No Appetite			
Indoor soiling of urine or stool /decreased signaling to go out			
Distracted/decreased focus			

ACTIVITY			
Not playing with toys, family members, other pets			
Aimless pacing or wandering			
Repetitive behaviors, e.g., _____circling _____ chewing _____licking _____ stargazing			
ANXIETY			
Anxiety when separated from human companions			
Reactive/fearful to visual (sights) or auditory (sounds) stimuli			
Fear of places/locations (e.g., new environments/going outdoors)			

MUSIC THERAPY	**(Only rate below on days 3-7 when applying music therapy)**		
Identify the presence and level of improvement of symptoms and behaviors. **If no improvement, then leave blank.**	✓ **Check <u>only</u> the symptoms or behaviors improved after music therapy within 24-hour period.**	**Score degree of improvement 1-10** 1 = *mild improvement to* 10 = *strong improvement*	
SOCIAL INTERACTIONS			

List improved behaviors _____ ___			
SLEEP/WAKE CYCLES List improved behaviors _____ _____			
EATING, HOUSE TRAINING, LEARNING AND MEMORY List improved behaviors _____ _____			
ACTIVITY List improved behaviors _____ _____			
ANXIETY List improved behaviors _____ _____			

Appendix B. Pre-Study Questionnaire

<u>Pre-Study Survey</u>
This pre-study survey will help understand if your dog has prior experience with music and other factors that might be helpful in understanding her/his reactions to the music you will be playing for them as part of this research.

1. What breed is your dog?
2. What age is your dog?
3. How long has your dog exhibited CDS symptoms?
4. Does your dog like music?
5. Describe your dog's history with music. What styles of music has your dog listened and how often do you play music on average?
6. How often do you sing to or around your dog? What do you sing and how often?
7. Does anyone in your household play a musical instrument? If so, what type and how often?
8. How often do you watch tv around your dogs? What do you watch around them and how often on average?
9. Have you ever brought your dog to live concerts? If so, what concerts and how often?
10. Does your dog have any other exposure to music or media that was not already covered in this survey? If so, what and how often?
11. Is there anything else about your dog you would like to share?

Appendix C. Consent form

Consent to Data Collection

I, _____, consent to participate in this research. Also, I consent to the release of my dog's recent medical information. I agree to report behavioral information about my dog (dog's name:_____) and (optionally) collect urine samples from my them for this study. I understand that this information and data about my dog will be used as part of David Hellrung's undergraduate honors research thesis titled, "A Multiple Case Study on the Effect of Music in Managing Chronic Stress in Dogs." David Hellrung is an undergraduate student participating in the Honors Program and minoring in Human-Animal Relationships at Texas Christian University. This research is supervised by Carol Thompson, Professor and Chair of the Department of Sociology and Anthropology and core faculty member of the Human-Animal Relationships Minor at TCU.

All data collected about your dog will be kept confidential and separated from any identifying information that can link you and you and your dog to the data collected for this research. We appreciate your assistance. If you have any questions, you may contact David Hellrung or Carol Thompson using the contact information provided below.

There is no incentive being provided for participating in this research. However, the value of this research is in exploring a way to assist your dog in managing symptoms associated with cognitive decline.

At any point this study you and your dog may drop out of the research. You may also partially participate by only consenting to the portions of the research you wish to complete. Please initial each of the items below acknowledging your consent to participate in these aspects of the study.

_____ Release of my dog's medical information and history.

_____ Optional: collect urine samples from my dog on days 2, 3, 7, 8, and 9 of the study, for the purpose of measuring cortisol levels in the urine. Cortisol levels indicate stress levels.

I understand that I must immediately refrigerate the urine samples and bring them on the day of collection to Westcliff Animal Hospital to ensure accurate results. I will notify David of any difficulty collecting these samples or if I need assistance in getting the sample to Westcliff Animal Hospital.

_____ Fill out behavioral inventory surveys on days 1-9 of the study regarding my dog and allow David Hellrung to pick up the surveys at the end of the study period.

_____ I will set up the necessary sound equipment for playing music supplied to me for this research 2 days before the study begins. I understand that if I am unable to set up the equipment myself, I can request that David Hellrung set up the equipment for me. Detailed instructions for setting up and breaking down equipment will be provided.

_____ After the study is completed, I will return study sound equipment to David Hellrung.

Name: _____

Signed: _____ Date: _____

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