# A PILOT STUDY OF PURSED LIP BREATHING, SINGING, AND KAZOO PLAYING ON LUNG FUNCTION AND PERCEIVED EXERTION OF PARTICIPANTS WHO SMOKE

BY

Leanne M. Wade

M.Div., Pacific School of Religion, 2006
M.A., University of the Pacific, 1998
B.A., Sonoma State University, 1993

Submitted to the graduate degree program in
Music Education and Music Therapy and the Graduate Faculty of the
University of Kansas in partial fulfillment of the requirements for the degree of
Doctor of Philosophy (Music Therapy)

_____
Chairperson: Dr. Cynthia Colwell

_____
Dr. Abbey Dvorak

_____
Dr. Deanna Hanson-Abromeit

_____
Dr. Debra Hedden

_____
Dr. Mary Fry

Date Defended: January 30, 2017

The Dissertation Committee for Leanne M. Wade
certifies that this is the approved version of the following dissertation:

A PILOT STUDY OF PURSED LIP BREATHING,

SINGING, AND KAZOO PLAYING ON LUNG FUNCTION

AND PERCEIVED EXERTION OF PARTICIPANTS WHO SMOKE

_____
Chairperson: Dr. Cynthia Colwell

Date Approved: January 30, 2017

## ABSTRACT

Smoking is the leading cause of Chronic Obstructive Pulmonary Disease (COPD). Symptoms of COPD include persistent cough and dyspnea. Currently, music therapy protocols relating to COPD are therapist dependent and exceed 5-minutes. This pilot study examined if a 5- minute intervention of pursed lip breathing, singing or playing kazoo affected lung functioning or perceived physical exertion. Participants reported which interventions they found to be most helpful for breathing and whether they would choose to participate in those interventions either alone or with a music therapist. Participants completed a pre-intervention spirometry reading, all three 5-minute interventions (pursed lip breathing, singing, and kazoo playing) randomized to reduce order effect, and a post intervention spirometry. Participants completed the Borg Rating of Perceived Exertion after each intervention and a post-intervention questionnaire. Participants ranked the interventions in order of which was perceived to be the most helpful for breathing. Mean results indicated pursed-lip breathing decreased the lung functioning while both singing and kazoo playing increased the lung functioning. The Ratings of Perceived Exertion results had minimal differences among interventions. Participants stated they would be willing to complete an intervention alone on a daily basis with three times a day being the most common answer. Participants ranked all three interventions similarly as being the most helpful to their breathing. Each music based 5-minute intervention (singing and playing kazoo) demonstrated a trend toward a positive change in lung functioning. The participants rated their perceived exertion as low with minimal change for all three interventions.

Keywords: COPD, lung function, singing, kazoo, smoking

# ACKNOWLEDGMENTS

Toward the end of my senior year in college, Marie Mielbrecht (my first flute/piano/bassoon teacher), told me, “I think you’d make a great music therapist. You need to speak with my friend about it!” And thus started my music therapy path. Never did I think my journey would lead me to the University of Kansas.

There are multiple people who need to be thanked for undying support and care throughout this process. When I arrived at KU, I was told that I would have the assistance of all the professors and I have. I am grateful to Dr. Cynthia Colwell for taking over as my advisor when Dr. Alicia Clair retired. Thank you for all the hours upon hours you put in to guiding me through the process, editing my papers, and meeting with me at a moments notice. To Dr. Deanna Hanson-Abromeit thank you for your comments and edits as well as your encouragement to look at a problem in a new way. To Dr. Abbey Dvorak, Dr. Debra Hedden and Dr. Mary Fry, thank you for taking the time to be on my committee and offering support and encouragement.

Special thanks to Dr. Alicia Clair who continued to share her wisdom and encouragement throughout this process.

I would like to thank the veterans home for approving my study and all the participants for taking the time to participate in my study.

Thank you to Dr. Heather Nelson who has literally stayed up all night helping me get through the final draft of this paper and helping me laugh. To Dr. Katy Rollins who always answered my respiratory therapy questions.

Throughout my life my mother has been my biggest cheerleader. I am grateful to have had parents who recognized my potential and encouraged me to go and do. I am

thankful I have a family who understood how important this degree was to me and assisted even from hundreds of miles away. They never doubted my abilities even when I doubted myself. I would have never made it through this daunting process without you. It is your love, support, and faith that has been amazing.

TABLE OF CONTENTS

# LIST OF TABLES

List of Figures

# CHAPTER I

## Introduction

Chronic lower respiratory diseases refer to several illnesses that impact the function of the airways and lungs. In 2011, chronic lower respiratory diseases, including chronic obstructive pulmonary disease (COPD), were the third leading cause of death in the United States, accounting for 142,943 deaths. Although COPD is currently diagnosed in 12.7 million adults age 40 and older (Centers for Disease Control, [CDC], 2014), it remains an under-diagnosed illness. An estimated 24 million people in the United States experience lung injury as a result of COPD (American Lung Association [ALA], 2014). The cost of treatment for each patient rises as COPD progresses. In the United States, patients spent $29.5 billion a year in direct costs such as hospitalization and medication, and an additional $20.4 billon in indirect costs such as missed days of work (CDC, 2014). COPD is a health crisis that will continue to grow as the population ages and as diagnoses become more prevalent.

COPD diagnostic criteria have broadened to include both emphysema and chronic bronchitis as one inclusive diagnosis. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defined COPD as a (a) "common preventable and treatable disease," (b) "is characterized by persistent airflow limitation," and (c) "is usually progressive" (GOLD, 2015, p. 2). Emphysema and chronic bronchitis challenge breathing in two different ways. Emphysema is associated with smoking and damages the alveoli, so they become too big to assist in the breathing process and instead trap air in the lungs. Chronic bronchitis blocks the airways with constricted bronchioles and overproduces mucus leaving no movement for air (GOLD, 2015).

**Etiology and Diagnosis**

There are a variety of etiologies for COPD, and the diagnostic process can be complicated as the symptoms are numerous and may be present or absent in varying degrees in each patient. Other respiratory diseases differentiated from COPD, such as asthma, may also be present and further complicate the diagnostic process and subsequent long-term care of the patient. The expanded definition of COPD, which includes chronic bronchitis and emphysema, further increases the difficulty of identifying individuals at risk of developing the illness (GOLD, 2015).

COPD develops in numerous ways with smoking as the most common cause. Previously, men were diagnosed with COPD more often than women because men smoked more than women. However, women are being diagnosed with increasing numbers than in the past (Miravitlles et al., 2006). In addition to smoking, other factors that can contribute to an increased risk of developing COPD include exposure to environmental particles, genetic disorders, or atypical lung development. Air pollution and occupational exposure to dust and chemicals can also play a role in disease development (Kajekar, 2007). A small percentage of individuals will develop COPD due to the genetic disorder, Alpha-1 Antitrypsin Deficiency (Stockley, 2014). Current research demonstrates that individuals with asthma or an early lung injury have a greater risk of developing COPD as they age (Kaneko et al., 2013). Both of these contributing factors may damage the lung early on causing disease development later in life. While the etiology of the disease may be difficult to trace, symptoms of the illness are similar across individuals regardless of root cause.

**Symptoms**

COPD symptoms include coughing, excess sputum, wheezing, and dyspnea. Not all of the symptoms may be present in each person nor are all of them necessary for a COPD diagnosis (Soriano, Zielinski, & Price, 2009). Each of these symptoms alters breathing in different ways. Early in the development of COPD, individuals may only experience one or two symptoms of varying degrees, which may not cause alarm. As the illness progresses, more symptoms and complications are likely to appear while others worsen and alter the quality of life of the individual. Individuals seek medical treatment and are hospitalized because of dyspnea which leads to painful or uncomfortable breathing and increased anxiety (Soriano, Zielinski, & Price, 2009).

**Psychological Impact**

Respiratory illnesses can cause a variety of emotional difficulties including panic, anxiety, guilt, and depression. The physical symptoms may complicate daily life by causing an individual to live in fear or panic that breathing will become difficult. Individuals with COPD might have increased anxiety and guilt issues if they smoked because they feel responsible for causing their illness (Plaufcan, Wamboldt, & Holm, 2012).

Isolation is an added factor impacting those with COPD. Individuals with COPD may limit socialization because of their concern with changing environments. Something as small as a change in temperature, indoors or outdoors, can cause difficulty in breathing. To avoid such situations, individuals often choose to stay home, limiting social interaction and support system possibilities and perpetuating this feeling of isolation. This may lead to isolation from peers and family and subsequently fuel any

already existing symptoms of depression and anxiety (Wilson, O'Neill, Reilly, MacMahon, & Bradley, (2007).

**Treatment**

Standard treatment for chronic respiratory diseases includes smoking cessation, medication, and pulmonary rehabilitation. Lung reductions and transplants may occur in extreme cases. Because smoking is strongly linked to the development of respiratory diseases, smoking cessation is a necessary step in controlling COPD. Quitting smoking can slow the progression of the illness (Gratziou et al., 2014). The barriers to quitting smoking include patients thinking it is too late to quit or they simply enjoy the act of smoking (Wilson, Elborn & Fitzsimons, 2010).

Medication is a key component in the treatment of COPD. Although there is no standard medication regimen that works for all individuals, there is a wide variety of medications prescribed to meet the needs of the patients. Medications are usually administered in the form of pills, nebulizers, or inhalers and all three methods of medication may be necessary to maintain proper control of the illness (GOLD, 2015 p. 20).

Pulmonary rehabilitation includes patient education, physical activity, and exercise, and coping skills (Troosters, Demeyer, Hornikx, Camillo, & Janssens, 2014). Patient education may include learning about COPD and what to do when they become short of breath. Physical activity addresses how to move while maintaining breathing ability and practice in recovering breathing when it has been compromised. This is done through simple exercises like walking. Coping skills address social support as well as dealing with anxiety and depression.

One of the biggest barriers to treatment is adherence. Treatment of COPD requires a multi-faceted approach, taking into consideration the way an individual lives. Non-compliance may manifest in several forms including refusal to quit smoking, not using medication correctly, and rejecting participation in physical exercise (Hayton et al., 2013; Khdour, Hawwa, Kidney, Smyth, & McElnay, 2012).

The ultimate goal in the treatment of COPD is preventing an exacerbation, which is an increase in difficulty breathing. Once an exacerbation has occurred, controlling the damage from the experience becomes essential. Returning an individual to their baseline functioning becomes the goal, but this may be an arduous process lasting up to 35 days (Wedzicha & Seemungal, 2007).

**Music Therapy**

Music therapists may understand breathing as vital to living and as a key component in playing wind instruments or singing; however, they may lack a deeper understanding as to what various body systems are doing during the breathing process. Furthermore, they may be treating individuals who have suffered a lung injury yet may not know exactly how to develop the best therapeutic interventions to meet appropriate treatment outcomes. Within this paper, a review of the development of the lung, mechanics of breathing, lung injury, and subsequent music therapy treatment approaches are examined.

With the number of individuals with COPD who go undiagnosed, and increasing instances of non-smokers developing the disease, it is important for music therapists to be able to address the needs of this compromised population. Furthermore, a treatment approach should include additional diverse treatment modalities to accompany the

traditional approaches of smoking cessation, medications, and pulmonary rehabilitation to avoid exacerbations, which can lead to hospitalizations and further complications and damage.

As previously indicated, smoking is the leading cause of COPD. As the disease progresses, the ability to breathe may be compromised before the individual notices this change. Once the illness is fully developed, the body will undergo a change in breathing, requiring more breaths per minute, which will cause discomfort (GOLD, 2015). Because breathing is compromised in COPD, treatment approaches may need to be implemented that are short in duration yet still impactful.

Pilot studies examine new interventions in order to find where improvements can be made before running a full-scale study (Leon, Davis & Kraemer, 2011). This study was completed with people who smoke due to their increased risk of developing COPD and because their current cigarette usage indicates their breathing may already be impacted. The purpose of this pilot study was to examine (a) if lung functioning changes occurred after a 5-minute session of pursed lip breathing, singing, or kazoo playing in individuals with a history of smoking; (b) if there is perceived physical exertion after each intervention, and how exertion compares between interventions; and (c) if participants would choose to engage in these interventions either alone or with a therapist.

# CHAPTER II

## Review of Literature

Breathing is an involuntary muscle movement controlled by the brain to move oxygen throughout the body to maintain life. Breathing patterns change according to different stimuli such as physical activity, illness, or emotionally charged situations. A drastic change in breathing may cause severe discomfort or pain, as well as anxiety in the individual. Breathing becomes a particular challenge for individuals with compromised airways. The purpose of this chapter is to review breathing/muscle mechanics, lung development, lung injury, lung disease and COPD. Standard treatments, as well as alternative interventions, will be described.

### Breathing/Muscles Mechanics

The breathing apparatus is divided into two sections: the upper respiratory system (i.e., nose, mouth, and trachea) and the lower respiratory system (i.e., bronchi and lungs). The medulla oblongata controls breathing through the use of inspiratory and expiratory neurons. When a person needs to inhale, a signal is sent to the inspiratory muscles (i.e., diaphragm, external intercostals, parasternal, sternomastoid and scalene), which causes the muscles to contract and move, bringing air into the lungs. When resting, the neurons relax, and the body exhales. However, when physical activity is involved, the expiratory neurons will fire a signal to allow the body to take a deeper breath and trigger the expiratory muscles (i.e., internal intercostal, rectus abdominis, external and internal oblique, and transverse abdominis). The peripheral chemoreceptors, located in the carotid arteries and the aortic arch, cue the brain to alert the muscles to breathe. These chemoreceptors stimulate the brain to increase rate or volume of breath. The central

chemoreceptor is located near the brain and can sense carbon dioxide, thus alerting the brain to increase the frequency of breathing to remove carbon dioxide (The Respiratory System, 2009).

## Lung Development

**Fetal lung development.** Fetal lung development starts after four weeks of gestation, and the lungs are the last organs to complete development. Infants who are born prematurely may not have developed a surfactant to assist their lungs' transition from working in the wet environment of the amniotic fluid to the dry environment breathing oxygen outside of the mother's womb. The purpose of the surfactant is to ensure the lungs do not collapse and stick together. The less time spent developing in the womb, the more likely it is for the infant to suffer negative impacts on long-term lung function (Burri, 2006).

**Childhood lung development.** Lung development continues after birth. Infants are not born with all the alveoli (i.e., small air sacs that make up the lungs), they will eventually need as an adult. Alveolarization is an increase in alveoli that multiplies the gas exchange surface of the lungs up to 20 times. Through the ages of 6 months to 3 years, the septa located in the alveoli have a double capillary network which allows for the expansion and growth of new alveoli (Burri, 2006).

**Adolescent/adult lung development.** Alveoli development is a process that continues into adulthood. Alveoli may help the lungs regenerate when early forms of damage occur (Burri, 2006). Maximum lung volume is reached and the single capillary network is formed in the lungs by the age of 22, signaling the end of development (Stocks, Hislop, & Sonnappa, 2013).

## Lung Injury

Lung injury can occur in a variety of ways and during different stages of life. Problems may arise in utero, hampering the development of the lungs. Illnesses such as pneumonia, bronchitis, or infection can cause scarring, damaging the lungs. Exposure to particulates, such as dust can permanently impair lung function (GOLD, 2015). Some individuals choose to smoke, which causes long-term damage to the lungs causing difficulty in breathing.

**Illness.** When children's lungs develop, illness can cause damage that alters the way in which the lungs function. Early and multiple exposures to lower respiratory tract infections can cause asthma or susceptibility to other illnesses (Harding & Maritz, 2012). Repeated lung infections such as bronchitis and pneumonia can cause long-term damage and scar tissue to form. This exposure to infections in childhood may lead to the development of Chronic Obstructive Pulmonary Disease (COPD) in later life (Soriano, Zielinski, & Price, 2009).

**Particulates.** Particulate matter is made up of minute solids and liquids that include haze, dust, smoke, nitrates, sulfates, and droplets. Exposure to particulate matter can compromise an individual's health. Smaller particulates, less than 2.5 micrometers, are dangerous because they can be inhaled deeper into the body (U. S. Environmental Protection Agency [EPA], 2015).

A variety of conditions may expose an individual to particulate matter. Smoke exposure may occur due to indoor wood burning stoves for cooking, forest fires, and second-hand smoke. People who work outdoors on roadways are exposed to exhaust from cars. As an individual works, he/she may be breathing more frequently and deeper,

increasing the number of particulates inhaled and taking them farther into the lungs (EPA, 2015). Particulate exposure may also be cumulative, thus protecting the lungs is of utmost importance.

**Smoking.** People begin smoking in adolescence and early adulthood. Approximately 42 million adults smoke with the majority of those being men. The Centers for Disease Control (2015) state that smoking is responsible for 9 out of 10 cases of COPD. Smoking causes several severe illnesses and is directly related to the development of COPD.

Smoking damages the lungs by paralyzing and killing the cilia while reducing the flexibility of the alveoli. The cilia are the small organelles located in the respiratory tract and lungs that move in a sweeping fashion to keep pollutants out of the lungs. They work with mucous to trap and remove damaging material from the lungs, reducing the chance of infection or disease. When the cilia are no longer viable, small particulates can pass through the respiratory tract and into the lungs, causing illness (American Lung Association, 2015).

The alveoli, small air sacs, are flexible and move oxygen into the bloodstream. Smoking changes the structure of the alveoli by damaging the ability to recoil back to the original size and by thinning the walls of the sacs. This damage causes the distance between alveoli to expand, complicating oxygen exchange and causing shortness of breath (ALA, 2015).

**Lung Disease**

Lung disease can prevent proper functioning by inhibiting the ability to breathe, causing damage to the tissue, and hampering circulation. Breathing is difficult with an

illness like asthma where the bronchioles become inflamed and block airways. Cystic fibrosis and bronchiectasis both impact the large airways of the lungs, causing breathing difficulty. Asthma and bronchiectasis can occur at any time in the lifecycle while cystic fibrosis is genetic and occurs at birth. Lung cancer damages the lungs and can cause scarring while impacting an individual's ability to breathe as well as threatening their life. Lung circulation issues impact blood vessels and include pulmonary hypertension and pulmonary embolism, which will also lead to shortness of breath (ALA, 2015; National Institutes of Health, 2015).

**Chronic Obstructive Pulmonary Disease (COPD)**

COPD is a progressive and eventually fatal disease. However, it is manageable for several years with medical care and adherence to treatment. The defining feature of COPD is irreversible airflow limitation (GOLD, 2015). COPD shares similar characteristics with asthma and can be misdiagnosed. Moreover, asthma has been linked to developing COPD later in life.

**Physical Symptoms.** The primary symptoms of COPD are a persistent cough, chronic sputum production, and dyspnea. These symptoms cause an airflow limitation, which can lead to an exacerbation impacting daily life and the sleep cycle.

***Cough.*** Coughing may be the first symptom of COPD an individual reports to their physician. It can be a difficult symptom to measure because it relies on an individual's memory of how frequently he/she coughs. More coughing experiences occur during daytime with a decrease in the night hours. Coughing may occur due to airway constriction, increased sputum production, reflex sensitivity, and smoking (Smith & Calverley, 2004). Individuals who smoke experience coughing frequently, but quitting

smoking can rapidly decrease coughing. The purpose of coughing is to remove sputum from the airways. Damaged motile cilia are unable to move excess sputum out of the airways where it can be expelled by coughing. The Forced Expiratory Volume in one second ($FEV_1$), the amount of air that is forcibly exhaled in one second, is lower in individuals who cough indicating an increase in disease severity (Smith & Woodcock, 2006; Sumner et al., 2013).

***Sputum.*** Sputum production is naturally occurring and functions to keep moisture throughout the breathing apparatus. Airway constriction occurs when the body begins producing too much sputum and becomes inflamed. People with COPD, who also smoke cigarettes, have an increase in white blood cells called neutrophils. These neutrophils include molecules that adhere to the inside of the lungs and cause airway constriction and limited breathing (Maestrelli, Richeldi, Moretti, & Fabbri, 2001).

***Dyspnea.*** Dyspnea is a painful shortness of breath that increases in severity, with or without physical activity. Standard spirometry will illustrate the shortness of breath but will not measure the level of pain. Patient reporting is necessary to determine the levels of pain, severity, and worsening of symptoms (Mahler, Ward, Waterman, & Baird, 2012). In attempting to control dyspnea, individuals may reduce their activity level, rest, or employ pursed-lip breathing (PLB) (Chen, K., Chen, M., Lee, Cho, & Weng, 2008).

***Exacerbation.*** An exacerbation is a dramatic change in the symptoms of COPD that leads to a worsening of gas exchange. Exacerbation is defined as "an event in the natural course of the disease characterized by a change in the patient's baseline dyspnea, cough or sputum that is beyond normal day-to-day variations, is acute in onset, and may warrant a change in regular medication in a patient with underlying COPD." (GOLD,

2015, p. 40). Some of the underlying causes of an exacerbation include viral and bacterial infections, exposure to environmental irritants, discontinuation of medication, and changes in diet (Voelkel & Tuder, 2000). Frequently, the underlying cause of the exacerbation goes untested due to time constraints. Once an exacerbation has started, the goal is relieving any discomfort the patient is experiencing. The main goal in treating COPD is avoiding exacerbations. Most individuals attempt to avoid an exacerbation by taking more medication or resting (Kessler et al., 2006).

***Sleep.*** Nocturnal COPD occurs when an individual experiences symptoms and exacerbations during sleeping hours. The severity of the disease will determine the intensity of a chronic cough, dyspnea, and exacerbations during the night hours. Oxygen desaturation decreases the blood's oxygen level as much as 13% during the night. Additionally, nocturnal oxygen desaturation can cause surges in pulmonary blood pressure, which will also disrupt sleep (Owens & Malhortra, 2010).

In a study by Roche, Chavannes, and Miravitlles (2013), the authors note that individuals with COPD experience sleep disturbances that increase the time it takes for individuals to get out of bed and directly correlates to the severity of the illness. In addition to morning setbacks, a lack of sleep also increases exacerbations. When an individual has not had enough sleep, it negatively affects their ability to care for themselves by impacting both activities of daily living and memory functioning (Omachi et al., 2012; Tsai, Brenner, & Camargo, 2007).

**Psychological symptoms.** Anxiety, panic, self-blame, and depression play a major role in the treatment and quality of life for people with COPD. Individuals with COPD frequently experience catastrophic thinking, panic, anxiety, and depression at

increased rates greater than the general population (Livermore, Sharpe, & McKenzie, 2010). Catastrophic thinking is the perception by the individual that breathing is becoming increasingly difficult without reason. These catastrophic thoughts may set in motion a series of events that eventually compromise the health of the individual and worsen the condition (Livermore, Sharpe, & McKenzie, 2012).

***Anxiety and Panic.*** Anxiety disorders are frequently diagnosed in people with COPD (American Psychiatric Association, 2013). When individuals experience anxiety and panic, it can negatively impact breathing. If left untreated, individuals may limit or avoid activities and events they previously enjoyed. Also, catastrophic thoughts may cause an increase in anxiety and fear and lead to increased avoidance of activities (Gurney-Smith, Cooper, &Wallace, 2002; Hallas, Howard, Theadom, & Wray, 2012; Kessler et al., 2006).

Clark's (1986) cognitive model of panic spectrum psychopathology purports that individuals may misinterpret normal body functions as dangerous and about to cause harm. Thus, individuals with COPD may be overly sensitive to normal changes in breathing. The model suggests that a trigger stimulus becomes a perceived threat, which causes apprehension and manifests as a physical sensation. This sensation is evaluated and misinterpreted as a threat. As this process cycles, it increases panic in the individual and complicates breathing (Clark, 1986; Livermore, Sharpe, & McKenzie, 2010; Livermore et al., 2012).

When an individual participates in basic daily activities, such as walking to the next room, they may experience some form of exertion that may trigger a change in breathing. It is this physical sensation that may be misinterpreted as a threat and cause

the individual to increase their respiration and therefore cause dyspnea to occur. Hyperventilation that causes light-headedness in typical functioning people may cause bronchoconstriction in individuals with COPD because of the increase in the number of breaths. Respiratory rate is directly linked to anxiety, which is linked to catastrophic misinterpretations. Continually responding to physical threats that are not there will cause an increased anxiety and may elicit more hospitalizations as well as depressive symptoms (Livermore et al., 2010).

***Self-blame***. Traditionally, COPD has been identified as a smoking illness caused by the personal choices and behaviors of the individual. How the individual views his/her role in the development of the disease plays a part in coping with COPD. According to Plaufcan et al. (2012), there are two different types of self-blame: behavioral and character. *Behavioral* self-blame takes into consideration the behaviors the individual engaged in that may have led to disease development. Behavioral self-blame scores increased for individuals based on the number of packs of cigarettes and number of years they chose to smoke. Increased scores indicate that individuals are aware that their smoking behavior may have led to developing an illness. *Character* self-blame refers to an individual feeling that their personal character flaw contributed to the illness. However, character self-blame is related to current smoking status and is more common in on-going smokers than in individuals who quit smoking. The individuals view themselves as not strong enough to overcome the addiction of smoking experience character self-blame which is linked to depression (Plaufcan et al., 2012).

***Depression***. Individuals with COPD experience depression at a higher rate than the general public (Zhang, Ho, Cheung, Fu, & Mak, 2011). Depression frequently goes

undiagnosed and untreated, which complicates the treatment of COPD and diminishes the quality of life for the individual. There is a direct correlation between frequency of exacerbations and depression scores. Individuals who experience more exacerbations are more likely to have depression than individuals who rarely or never experience an exacerbation (Quint, Baghai-Ravary, Donaldson, & Wedzicha, 2008).

**Diagnosis.** A diagnosis of COPD should be considered when a patient is over the age of 40 and presents with symptoms of dyspnea, cough, chronic sputum, and has a smoking history (GOLD, 2015). However, having some of the symptoms of COPD does not necessarily mean an individual has the illness.

The diagnostic testing for COPD requires a spirometry reading. This is a pulmonary function test that measures both inspiration and expiration and determines the level of airflow limitation. Spirometers measure breathing multiple different ways, the Forced Expiratory Volume at one second ($FEV_1$) and Forced Vital Capacity (FVC) are calculated in liters and are common measures of lung capacity. The $FEV_1$ is the amount of air that can be forcibly exhaled in one second after a full inhalation. The FVC is the amount of air that is in the lungs that is exhaled during the test. Both the $FEV_1$ and FVC will be lower in an individual with COPD. The diagnosis is confirmed when airflow limitation is noted at less than 70% ratio of $FEV_1$ to FVC. Once a diagnosis is established, COPD is classified into four levels of severity: mild (less than 70%), moderate (less than 50%), severe (less than 30%), and very severe (less than 30% and in respiratory failure). These levels are based on increasing airflow limitations that cause the severity increases. To classify the severity of the illness, spirometer levels of the

amount of air moving during the $FEV_{1,}$ along with symptoms and risk of exacerbation are taken into consideration (Liou & Kanner, 2009).

Spirometers and peak flow meters are two devices that can analyze respiratory symptoms (Liou & Kanner, 2009; Soriano et al., 2009). Spirometers remain the standard for analysis and diagnosis. Spirometers measure both the inhalation and the exhalation process. Although spirometers are used in diagnosing and measuring lung function, individuals with COPD can also use peak flow meters to analyze how well the lungs are functioning (Murata, Kapsner, Lium, & Busby, 1998). Peak flow meters require an individual to forcibly blow out air as fast as they can to measure how well the lungs are moving air.

**Standard Treatment**

Standard treatment after hospitalization for COPD exacerbation includes three main components: smoking cessation, medication, and pulmonary rehabilitation. The goal of these three treatment strategies is to keep an individual as functionally independent as possible, for as long as possible, so he or she can carry out activities of daily living.

**Smoking Cessation.** Smoking cessation is necessary for the treatment of COPD. Because smoking causes the greatest damage to the lungs, quitting can change the trajectory of the illness. Although an individual may not reverse damage after quitting smoking, he/she may lessen the symptoms and slow the progression of the illness. Older patients (i.e., approximately 68 years old) with COPD who view their doctors as experts in diagnosis and treatment are more willing to comply with treatment by quitting

smoking (Agh, Inotai, & Meszaros, 2011; Khdour, Hawwa, Kidney, Smyth, & McElnay, 2012; Qian et al., 2014).

Attempting to quit smoking without assistance is difficult and less likely to be successful (Thabane & COPD Working Group, 2012). Smoking cessation can be achieved through nicotine replacement, pharmacological interventions, and counseling (Tashkin & Murray, 2009). Psychosocial support includes group support and individual mentoring. Individuals who have positive social support, lack a mental health history and have a shorter smoking history have a better chance of being successful in quitting. There are several barriers to quitting smoking including cravings, enjoyment, and stress relief (Twyman, Bonevski, Paul & Bryant, 2014). Even with assistance, if an individual does not want to quit smoking, he/she will not, even when they are aware it is to their detriment. In a survey by Agh et al. (2011), out of 170 participants, 75% of respondents continued smoking even after being diagnosed with COPD.

**Medication.** Medications are necessary to treat COPD and control severity of exacerbations and stabilize symptoms; however, medication compliance is poor in individuals with COPD due to the number and schedule of medications they are prescribed. Medication adherence is better in older individuals and non-smokers (Agh et al., 2011). Patients will adhere to medication compliance when they understand the illness, trust the doctor (Johnson, Kong, Thoman, & Stewart, 2005; Khdour et al., 2012), and feel the effects immediately (Bender, 2012). The goal is to avoid an exacerbation and relieve symptoms, which can only be done if the patient is compliant.

Treatment of COPD includes several classifications of medications, corticosteroids, short and long-acting beta-agonists, and short and long-acting

anticholinergic. The goal of these medications is to prevent or stop an exacerbation. These types of medication are delivered through an inhaler or a nebulizer in order to reduce side effects.

Corticosteroids are medications that treat inflammation or swelling and are frequently used for breathing. Medications, like prednisone, are prescribed to keep the bronchioles from becoming inflamed. They can be taken by tablet or inhaled. These medications have fewer side effects when taken by inhalation, however, may cause bone demineralization and skin bruising (Chee, Sellahewa & Pappachan, 2014).

Beta agonists come in two types, short-acting beta agonist (SABA) and long-acting beta agonist (LABA). The purpose of both SABA and LABA are to keep the bronchioles relaxed and allow air to flow through within a matter of minutes. Short-acting beta agonist works for four to six hours and are required more than once a day. Long-acting beta agonist can last for up to 12 hours. Side effects include increased heart rate, feelings of shakiness, which mimic a feeling of anxiety and can cause breathing to get worse (Chee & Sing, 2008).

Anticholinergic medications affect the large muscles surrounding the bronchi but do not work as quickly as the beta agonist medications. Short-acting anticholinergics will begin working in approximately 15-minutes and last six to eight hours. The long-acting anticholinergic (Spiriva) will begin working in 20 minutes and last 24 hours. They work by blocking the muscarinic receptors that cause the muscles in the breathing apparatus to contract (Chee & Sin, 2008). These medications are used in COPD maintenance and frequently doctors will not use them in an emergency.

Inhalation is the most effective way to deliver COPD medication because they go directly to the lungs and do not have to travel through the entire body and begin working immediately. Inhaled medication may be dispensed through metered dose inhalers (MDI's), dry powder inhalers (DPI's), and nebulizers (Chee & Sin, 2008)

The advantage of using MDI's includes administering a consistent dose of medication with each puff, improving the lung emptying, and reducing hyperinflation (MacNee & Calverly, 2003). MDI's are also portable and require only a minute to take the medication. Some disadvantages of the MDI's are remembering to shake the canister prior to use, being able to coordinate the breath and depression of canister, and holding the breath after the medication had been administered (Ray & Stevens, 2013). MDI's have a wide variety of medication available.

Dry powder inhalers (DPI's) share some of the same advantages as MDI's, such as portability and a short treatment time, however DPI's require a quick inhalation. Some DPI's are triggered by breath by an inhalation. If an individual's breathing is too slow, they may inhale too much of the medication in one use and not have enough for the entire month. Humidity can affect the DPI causing the medication to clump and disrupt delivery (Ray & Stevens, 2013).

The nebulizer is a device that creates continuous extremely small mist of medication and can get into the lungs faster. The advantages of using a nebulizer include not having to breathe deeply or coordinate breathing with the device to inhale the medication. Nebulizer treatments range in time from three minutes up to ten minutes depending on the machine. The disadvantage of a nebulizer is the time it takes for the

treatment and cleaning. Although they are smaller than in the past, it is still a larger piece of equipment than an MDI and requires an electrical outlet.

**Pulmonary Rehabilitation.** Pulmonary rehabilitation focuses on individuals with moderate to severe COPD and occurs with a physician's referral after a patient has experienced an exacerbation but is stable. The length of pulmonary rehabilitation varies though greater success, and better results are correlated with a longer duration of treatment. A minimum of eight weeks for rehabilitation is recommended with sessions occurring two or three times each week (Troosters et al., 2014).

Troosters et al. (2014) define pulmonary rehabilitation (PR) as:

> A comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies, which include, but are not limited to, exercise training, education, and behavior change designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote long-term adherence to health-enhancing behaviors (p. 242).

Exercises focus on both upper and lower body and include arm exercises, interval cycling, and activities of daily living (van Helvoort, de Boer, van de Broek, Dekhuijzen, & Heijdra, 2011). The patient is taught how to increase their stamina by using resistance, thereby strengthening both the inspiratory and expiratory muscles (Ratnovsky, Elad, & Halper, 2008). Exercises are introduced for a few minutes followed by rest so the patient can learn how to control his/her breathing.

Pulmonary rehabilitation (PR) covers a variety of different life skill areas that may not be addressed medically, such as learning how to avoid becoming short of breath, and conserving energy while completing a task. In addition to these skills, PR addresses

coping skills, depression, weight-loss, and muscle movement. Nurses and respiratory therapists assist the patient in care and education. Participating in pulmonary rehabilitation increases the quality of life for patients (Monteagudo et al., 2013).

Not all patients choose to participate in pulmonary rehabilitation, even though education about the illness is necessary to decrease exacerbations and hospital stays. Some avoid this program because they think the disease is not severe enough to warrant participating in treatment. Individuals with severe COPD may also choose not to participate because they feel the disease has progressed and is too severe for the rehabilitation to help. Individuals with high anxiety and depression are less likely to participate, as are those with long-term oxygen therapy. Frequently, when someone has started pulmonary rehabilitation, they may quit due to experiencing an exacerbation that causes them to not return to the program (Hayton et al., 2013). The skills gained in pulmonary rehabilitation are only temporary as the disease is progressive. Without continual exercise and practice, individuals will lose the skills learned in pulmonary rehabilitation.

***Breathing Techniques.*** Individuals with COPD are encouraged to engage in breathing techniques before beginning a task which may take more air, like exercising. Currently, no established protocol exists that standardizes the amount of time individuals should engage in breathing techniques. Respiratory muscle strength is impaired in individuals with COPD. Strengthening the muscles may assist in decreasing incidences of dyspnea and increasing exercise capacity. In a study by Weiner, Magadle, Beckerman, Weiner, and Berar-Yanay (2003), participants learned either inspiratory or expiratory muscle strengthening techniques while one group experienced both. The group that was

trained in both inspiratory and expiratory muscle group exercises showed an increase in respiratory muscle strength.

Pursed lip breathing (PLB) is a process in which an individual inhales through the nose and exhales through pursed lips, which provide resistance. The inhalation is for a count of two while the exhalation is a count of four or six. A short inhalation helps in avoiding taking in too much air while the longer exhalation releases the carbon dioxide built up in the lungs. Some individuals naturally use pursed lip breathing when they experience shortness of breath. It appears to have several advantages: first, it decreases the frequency of breathing; second, it lengthens the breath; and third, it decreases oxygen consumption (Jones, Dean, & Chow, 2003; Spahija, de Marchie, & Grassino, 2005). Spahija et al. (2005) used an 8-minute treatment of pursed-lip breathing to assist individuals in regaining breath control after a physically difficult activity. Pursed-lip breathing was effective in slowing down the breathing pattern for some of the individuals. According to Faager, Ståhle, & Larsen (2008), pursed lip breathing allows individuals to walk longer and experience less oxygen desaturation during a 6-minute shuttle walk test. In their study, individuals spontaneously used PLB. However, not everyone benefits from pursed lip breathing. Individuals who hyperinflate their lungs are already breathing deeply and do not find pursed lip breathing effective in decreasing dyspnea (Bianchi et al., 2007).

Traditionally, in pulmonary rehabilitation, individuals with COPD were taught diaphragmatic breathing. Vitacca, Clini, Bianchi, and Ambrosino (1998) studied the effects of diaphragmatic breathing teaching individuals with COPD how to do diaphragmatic breathing during three 30-minute sessions prior to the study. Although

diaphragmatic breathing yielded increases in arterial blood gases, it also increased dyspnea in the participants. Hypercapnia is an increase of carbon dioxide in the lungs. If hypercapnia is present, then diaphragmatic breathing is deemed inappropriate and individuals are encouraged to use natural breathing patterns due to their inability to exhale the carbon dioxide. Diaphragmatic breathing may increase the amount of air being inhaled but does not assist in removing the air from the lungs (Vitacca, Clini, Bianchi, & Ambrosino, 1998).

**Alternative Treatments.** Alternative treatments for COPD focus on breathing in creative and diverse ways in order to change lung functioning. Some of these techniques may be effective because they require a focus on breathing embedded in a technique intentionally designed for relaxation and/or distraction.

***Tai Chi and Yoga.*** Tai Chi and yoga have been used to alleviate symptoms of COPD. Both Tai Chi and yoga require a focus on breathing while completing physical movements. In a randomized control trial, Chan, Lee, Suen, and Tam (2011) assigned COPD patients to one of three groups: exercise, Tai Chi, and a control group. Individuals completed two one-hour sessions per week across three months. The Tai Chi group experienced an increase in walking distance, forced expiratory volume, and forced vital capacity.

In a pilot study by Donesky-Cuenco, Nguyen, Paul, and Carrieri-Kohlman (2009), 29 older adults with COPD engaged in yoga for a 12-week period. This yoga class was directed toward individuals with chronic illness and used timed breathing to assist with each physical movement. Participants' dyspnea intensity did not decrease, however

dyspnea-related distress decreased and the six-minute shuttle walk test yielded positive results.

***Music Interventions.*** Breathing is essential when singing and playing brass and wind instruments; however, not many studies have addressed using music as a potential treatment specifically for respiratory diseases. Techniques that have been incorporated to alleviate symptoms of respiratory illnesses include guided imagery (Wai-Shan Louie, 2004), singing (Anderson, 2012; Engen, 2005; Lord et al., 2010), singing and relaxation (Bonilha, Onofre, Vieira, Prado, & Martinez, 2009; Singh et al., 2009; Wade, 2002), recorder and kazoo playing (Anderson, 2012), harmonica playing (Alexander & Wagner, 2012), didgeridoo playing (Eley & Gorman, 2010), device guided cueing (Borge et al., 2015; Gavish, 2010;), and music listening (Axen, Haas, & Thornby, 1995; Eley & Gorman, 2010). Within these studies, only a few have employed music therapists to carry out the treatment intervention (Anderson, 2012; Engen, 2005; Wade, 2002).

In Wai-Shan's study (2004) individuals with COPD underwent seven sessions of guided imagery relaxation. The first six sessions were for practice with data collected only during the seventh session. A pre-recorded guided imagery script was played with "soft music" in the background. Although oxygen saturation increased with statistical significance, no changes in other areas were statistically significant, including heart rate, thoracic surface electromyography, skin conductance, or peripheral skin temperature.

Borge et al. (2015) used a biofeedback device, playing music to guide three groups of participants with COPD in breathing. The guided deep breathing group was instructed to breathe slowly while connected to a device. A held note cued the participants' inhalation and exhalation. The music listening group was not given specific

information about breathing slowly. The control group was given the music to listen to with no instructions. There were no statistically significant differences between the guided deep breathing group and the music listening group, however, the guided deep breathing group was able to slow their respiration rates. Some of the difficulties noted in this study included a potential inability to entrain with the device because of the seriousness of participants' illnesses.

Alexander and Wagner (2012) used harmonica playing to attempt to increase lung function in individuals with COPD. During their study, individuals were instructed how to breathe through the harmonica and given exercises to play independently. Within this study, it is noted that the nurse, respiratory therapist, or staff gave the instrument playing instructions. There is no further explanation as to the qualifications of those individuals to teach harmonica or use it for a therapeutic outcome. In addition, there is no description of the type of exercises given to the participants and whether or not the participants enjoyed playing the instrument. Although participants' perception of their breathing abilities did increase, there was no evidence of an increase in the $FEV_1$.

Bonilha et al. (2009) examined 24 weeks of singing classes one time a week for individuals with stable COPD, each session lasting an hour. During the sessions, a physiotherapist led relaxation exercises (approximately five minutes) and a singing teacher led respiratory exercises (10 minutes), vocalizations (15-minutes), and singing of Brazilian folk songs (30 minutes). Individuals were encouraged to practice at least twice a week for 30 minutes each, however it is unknown if this occurred. During the course of the study, individuals had an increase in quality of life scores. After vocalizations, coughing increased which allowed individuals to move sputum out of the lungs.

Similarly, Lord et al. (2010) studied singing classes that met twice a week for six weeks for a total of twelve sessions as well as a separate, drop in class for anyone interested in attending, which also met for twelve sessions. Classes were led by a singing teacher and focused on posture, relaxation, and vocal exercises with singing homework. Participants in the formal classes exhibited better Hospital Anxiety and Depression Questionnaire scores, however, the breathing measures did not improve. Both groups reported that the singing taught them a different way of breathing which they found helpful.

In an unpublished thesis by Anderson (2012), three adolescents hospitalized with Cystic Fibrosis choose to either play an instrument or sing for ten, 30-minute sessions, completed over a five-day period while hospitalized. During the control period, also ten sessions, the adolescents chose to play games or talk. Anderson instructed the participants on diaphragmatic breathing and used "simple warm-ups" before playing or singing preferred songs in the session. All three participants increased their pulmonary functioning, however, it is unknown if statistically significant due to the small number of participants.

The most comprehensive study on respiratory illness in music therapy examined the impact of singing on individuals with emphysema (Engen, 2005). Engen used a variety of techniques including singing, posture, and vocal warm-ups to train seven participants in breathing within a group setting. Song choices and keys were determined before the sessions began, the music selections were described as call and response, pop, gospel and folk music. The pre-interview process determined patient music preference. During the warm up, a variety of items were used as visual aids for airflow, such as

bubbles and pinwheels. The singing of songs followed the warm up after a brief break. Songs were short and with limited range, progressing to longer phrases over the course of the sessions. Breathing was taught during the sessions; diaphragmatic breathing increased while clavicle breathing decreased indicating a desired change as participants stopped engaging their shoulders while breathing. Both increases in breath management and breath support were significant in this study.

**Summary**

Results of music interventions for individuals with COPD are mixed. This may be due to when interventions were started in relation to the exacerbation. Individuals in these mentioned studies have been diagnosed with COPD and some have received pulmonary rehabilitation, which occurs after an individual has had an exacerbation. Music interventions have not reported information on individuals early, before diagnosis or with a mild COPD diagnosis. It may be at this point a change in breathing may be most beneficial, before the lung has succumbed to damage.

Within these studies, singing demonstrated increased diaphragmatic breathing, breath management, and coughing (Anderson, 2012; Bonilha, 2009; Engen, 2005; Lord et al., 2010; Wade, 2002). Guided imagery sessions slowed the respiration rate of those with COPD (Borge, 2015). While harmonica playing (we do not know what music they played), gave individuals the perception their breathing was better (Alexander & Wagner, 2012). Playing, and singing did change their mood. It is important to note that they did not get worse from participating in music.

It may be at the mild stage of COPD that interventions may be most beneficial. Mild COPD may be asymptomatic in individuals but present an increased risk for

respiratory infections and respiratory failure (Chee & Sin, 2008; Price, Freeman, Cleland, Kaplan & Cerasol, 2011). Frequently, these individuals are misdiagnosed with asthma due to being breathless and can be treated at home. Ideally, identifying individuals with the illness would happen before they seek medical treatment for an airflow limitation, however most patients are diagnosed once they have progressed to stage two (Price, et al, 2011).

From the literature review, various pieces of information are understood. First, smoking cigarettes is directly related to developing COPD, second, the primary goal in the treatment of COPD is maintaining the ability to breathe while avoiding exacerbations; third, pulmonary rehabilitation is not standardized and each hospital will include different treatments of varying lengths; fourth, pursed lip breathing decreases the number of breaths and lengthens the exhalation to remove carbon dioxide from the lungs; and fifth, singing may provide some benefit to individuals who have difficulty breathing by changing the way they breathe and providing motivation for rehabilitative processes (Bonilha, 2009; Engen 2005).

It is unknown is if lung functioning changes after a 5-minute intervention. Spahija, et al., (2005) used a brief breathing intervention of only eight minutes to slow breathing down in individuals with COPD after physical exertion. The duration of music interventions for individuals with pulmonary illnesses widely range from fifteen minutes to an hour. Engen's study (2005) provided the patients with a break halfway through the session. Within pulmonary rehabilitation, some interventions are only a few minutes long and are to be practiced throughout the day (K. Rollins personal communication, 2015). It is highly unlikely an individual will complete a singing or playing intervention

lasting 15 to 60 minutes independently. It is unknown if participating in singing or playing a kazoo will be physically taxing on an individual with compromised breathing or whether or not individuals would be willing to participate in this form of treatment intervention? It is important to know what a brief music therapy intervention can do and whether it will have an impact on lung function. Determining the ideal amount of time for an intervention can assist in developing an effective treatment plan. Therefore, the purpose of this study was to examine (a) if lung functioning changes occured after a 5-minute session of pursed lip breathing, singing, or kazoo playing in individuals with a history of smoking, (b) if there was perceived physical exertion after each intervention, and (c) if participants would choose to engage in these interventions either alone or with a therapist.

Specifically, this research study addressed the following research questions:

1. Did an individual 5-minute intervention of pursed lip breathing, singing, or playing kazoo affect lung functioning [as measured by a spirometer]? Was there a difference among interventions?
2. Was the rating of perceived exertion (RPE) different among pursed lip breathing, singing, or playing kazoo interventions? How did the rating of perceived exertion compare among the interventions?
3. Are participants willing to use pursed lip breathing, singing, or playing kazoo if it positively impacted their breathing?
4. How often per day were participants willing to use pursed lip breathing, singing, or playing kazoo on their own or with a music therapist?

5. Did the participants think pursed lip breathing, singing, and playing kazoo improved breathing? Which of the three interventions did the participants think was most helpful?

# CHAPTER III

# METHOD

## IRB Approval, Recruitment, and Informed Consent

The researcher sought Institutional Review Board approval from a large Midwestern University affiliated with the researcher and the Residential Care Coordinator at a veterans home facility in the State of California where the researcher is employed. Participants were recruited through the therapeutic activities office at a state-run veteran's home by written announcement posted on campus in the residence halls, the tavern, smoking areas, and on the bulletin boards in the Member Services building (Appendix A). Potential participants contacted the researcher in order to begin the consent and eligibility process. All participants were asked to sign an informed consent before beginning the eligibility process and were provided with a copy of a signed form (Appendix B) and as appropriate, with a reminder of their individual study date and time (Appendix C). If a potential participant refused to sign consent, they were not evaluated for eligibility and were thanked for meeting with the researcher. If a potential participant did not meet eligibility requirements, he was thanked for meeting with the researcher and explained the reason for not continuing in the study.

## Participants

Recruitment commenced at a veterans home in which the residents were predominantly male (88%). Participants were a convenience sample of male veterans ($N$=12), ages 55 to 90, who lived in the domiciliary part of a state veteran's home campus, smoked cigarettes daily, and volunteered for participation. The Cigarette Dependence Scale 5 item (CDS-5) determined how much a participant smoked daily; a

minimum score of five was needed to be included in the study (Appendix D). Inclusion in the study was also dependent on the participant's ability to follow directions demonstrated by completing a successful initial spirometer test (Appendix F) and playing a kazoo (Appendix K). The initial meeting occurred at a different time and day before participating in the study. Before being assigned to participate in the study, individuals completed a trial kazoo attempt and spirometer measure. Individuals were excluded from the study if unable to play the kazoo after five attempts or unable to follow the directions for the spirometer (Figure 1). Participants were excluded from the study if they were female, only smoked occasionally as determined by the CDS-5, or lived in licensed care. Individuals who lived in licensed care are under doctor orders and would require the researcher to meet with each treatment team to gain permission for their participation. Furthermore, individuals who reside in license care may require assistance in leaving the building in order to participate in the study.

**Design**

This study was a counterbalanced measures design. A sample of 12 participants completed all three interventions: pursed lip breathing, singing, and playing kazoo. The order of the three interventions was randomly assigned to each participant. The pursed lip breathing intervention was number 1, singing intervention was number 2, and kazoo playing intervention was number 3. There were six possible order combinations using these three interventions. Once each of the six orders for interventions were met, the seventh participant was assigned to the same order as the first participant, the eighth participant the same order as the second participant, and so on, to ensure balance of participants across different order groups. Order selection required an iPad and a random

number generator application. The six different orders were determined as part of the study design prior to recruitment. The order was as follows: 2, 1, 3; 1, 3, 2; 3, 2, 1; 2, 3, 1; 1, 2, 3; and 3, 1, 2.

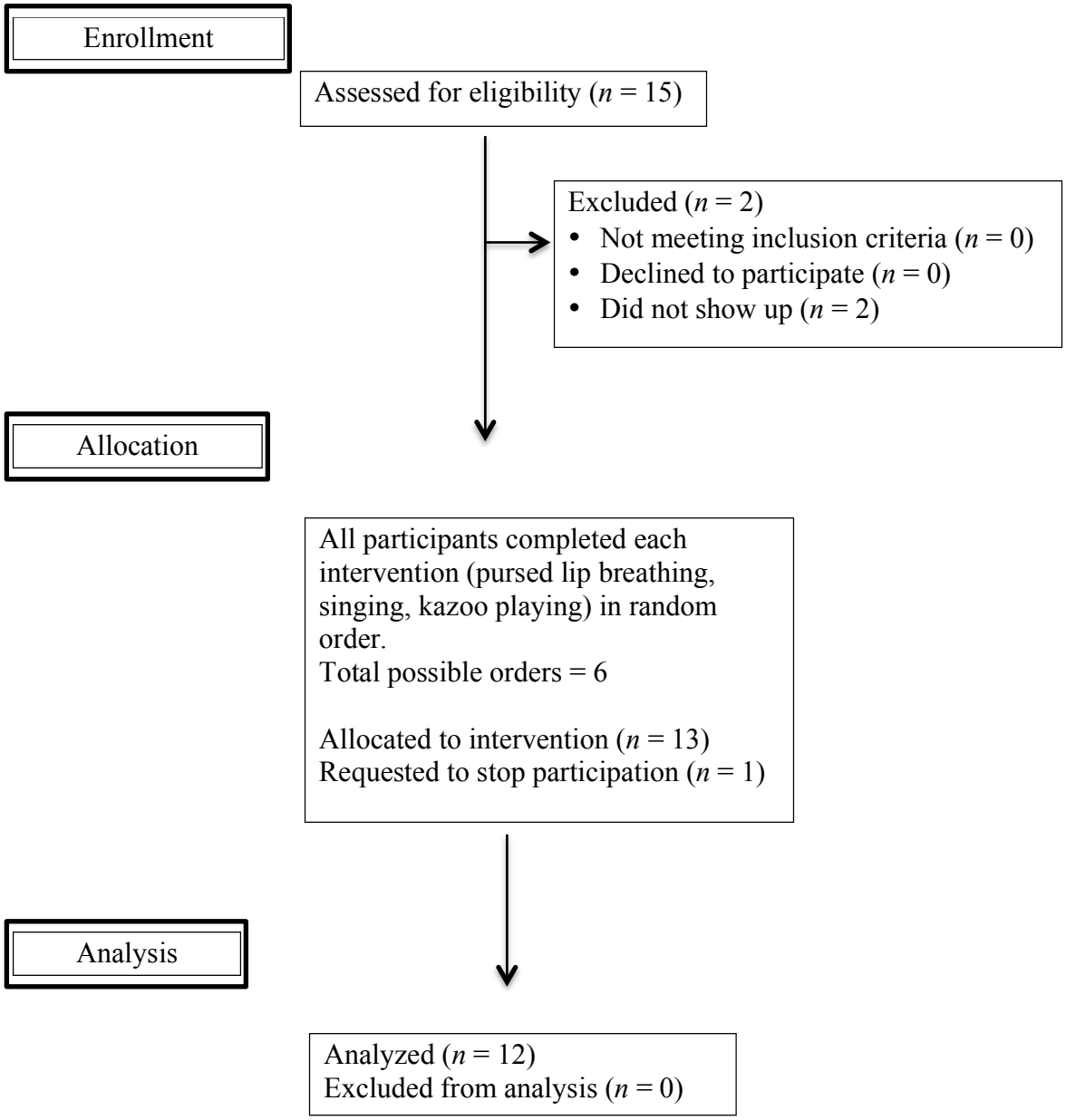


*Figure 1*. Participant Flow Chart CONSORT.

**Music**

The music therapist pre-selected music used for both singing and kazoo playing interventions and each included guitar accompaniment. Length of phrase, demographic familiarity with the music and similarity among songs guided the song selection. The four songs, *You're A Grand Old Flag* by George M. Cohan (1906/2000), *This Little Light of Mine* (Traditional, 1939/1996), *When the Saints Go Marching In* (Traditional, early 1900's/2000), and *This Land Is Your Land* by Woodie Guthrie (1940/1996), were selected for their time signature, melody, and length. The pre-selected songs included American folk tunes likely familiar to several generations of veterans and frequently used in a variety of music sessions at the home.

The songs utilized either 2/4 or 4/4 time signature in order to make it easier to quickly transition to the next song and maintain consistency rather than shifting from duple/quadruple meter to triple meter (3/4). The songs contained predominantly stepwise melodies and provided some internal repetition to facilitate ease of learning. The lengths of the phrases in these songs were short, coincided with the ending of a phrase of the words, and ended on either a half or whole cadence that allows for a pause and subsequent breath. The guitar harmonic accompaniment for the singing and kazoo interventions maintained a tempo of 120 beats per minute using a metronome with a blinking light. The accompaniment was a downward strum on each beat. This tempo allowed the participants adequate time to take a short breath between phrases and exhale through singing without requiring vocalizations for a long phrase on one breath. The researcher sang or played kazoo along with the participant while accompanying them.

**Measurements and Equipment**

**Measures.** The following measurements were completed: Cigarette Dependence Scale 5 item (CDS-5) (Appendix D), Borg Rating of Perceived Exertion (RPE) (Appendix G), and post-intervention questionnaires (Appendix H).

The Cigarette Dependence Scale 5 items (CDS-5) measured an individual's level of addiction to cigarettes. It is a five-question scale that asks individuals how many cigarettes they smoke a day and how soon after getting out of bed they begin smoking. Scores can range from zero to 25. Question two asked, "On average, how many cigarettes do you smoke per day?" For the purpose of this study, the researcher was interested in the number of cigarettes an individual smokes daily. If an individual stated that he did not smoke daily, the rating for the question was zero, which decreased their score to four, disqualifying them from participating. The minimum number required to participate in the study was five. The CDS-5 has content validity and gives cigarette smoking information (number of cigarettes and when they start smoking each day) (Etter, Houezec, & Perneger, 2003).

The Borg Rating of Perceived Exertion (RPE) scale is a subjective measure of how hard the body is working (Appendix G). The RPE is scored starting at 6 (no exertion) up to 20 (the most intense exercise experience). Measurements take into account the physical sensations an individual may experience during exercise (Borg, 1998).

The post intervention questionnaire was completed three times, once after each of the three interventions (Appendix H). The questionnaire asked participants if they thought pursed lip breathing, singing, and/or kazoo playing was effective, and if they

would be willing to do these activities on their own or with a music therapist. After completing all three interventions and the post intervention questionnaire, participants verbally ranked the interventions from most to least effective.

**Equipment.** The Spirolab® spirometer by Medical International Research USA, Wisconsin was used. A disposable mouthpiece and a nose clip were provided for each participant for use during the spirometer testing. An Apple iPad with the Random NumGenerator application allocated treatment order before meeting with participants. Music equipment included: one kazoo per individual, metronome, music stand, guitar, and lyric sheets for pre-selected songs.

The Spirolab® recorded multiple measures in one exhalation: PEF, $FEV_1$, and FVC. Oxygen saturation is measured by placing the first finger in the sensor on the Spirolab. A disposable mouthpiece and nose clip was used for each participant in order to measure the peak expiratory flow (PEF), the forced expiratory volume 1second ($FEV_1$), and the forced vital capacity (FVC). For an accurate reading, each participant wore a nose clip while forcibly exhaling into and breathing through the spirometer. They placed the mouthpiece of the spirometer in their mouth, tightly closed lips around the mouthpiece, and forcibly exhaled until they could no longer do so. Ideally, the exhalation lasts approximately 6 seconds. The spirometer measure was taken once before commencing the implementation of the interventions and before and after each intervention for a total of seven readings. In addition, the spirometer measured oxygen saturation, which determined how well each individual is breathing before beginning the intervention. If oxygen saturation was below 90, the participant was asked not to complete the research study for safety reasons and those instances were noted in the

participant flow chart (see Figure 1). The peak expiratory flow (PEF) measured the speed at which air is exhaled and is recorded as liters per minute. The scale for an adult measure of a peak expiratory flow is 300 to 800 with a higher number meaning more air is moving out of the lungs. Both the forced expiratory volume 1 second and the forced vital capacity were measured at the same time. The forced expiratory volume 1 second ($FEV_1$) is the amount of air that is forcibly exhaled in the first second. The forced vital capacity (FVC) is the total volume of air forcibly exhaled measured on a scale of 0 to 6.6. Higher numbers indicate that more air is being exhaled out of the lungs, which is ideal.

A plastic kazoo was provided for each participant. Participants were asked if they would like to keep the kazoo after they completed the study. If not, it was disposed of following completion of the intervention.

The researcher utilized the metronome and guitar. The metronome model Zen-On Metrina Quartz Metronome has a light that flashes the beat to avoid a disruptive sound and was not visible to the participant. The researcher accompanied both singing and kazoo playing on a Taylor 312ce steel string guitar.

Before beginning an intervention on the day of a participant's appointment, an oximeter reading (SpO2) was taken. A reading below 90 would be cause to turn the participant away for health safety reasons. All participants completed each intervention (pursed lip breathing, singing, kazoo) to act as his own research control. Seven spirometry readings and three Borg Ratings of Perceived Exertion (RPE) were recorded. Participants completed a baseline spirometer reading before beginning any intervention and then before and after each intervention. Each spirometer reading required three attempts of breathing into the device. A thirty-minute break occurred between

interventions. An outline of the order can be seen in Figure 3. The participants could sit, get a drink of water, and use the restroom, but not smoke. They were instructed to avoid the stairs and to not leave the building. At the conclusion of each intervention, participants completed a post-intervention questionnaire.

**Treatment Interventions**

**Pursed-Lip Breathing.** The control intervention was pursed-lip breathing (PLB) that is used with patients with COPD to assist in controlling their breathing before, during, and after an exacerbation (Spahija et al., 2005). Participants were taught pursed lip breathing (Appendix I) and determined their own rate of breathing. During pursed-lip breathing, the inhalation is shorter than the exhalation. Inhalation was counted as 1, 2 and exhalation was counted as 1, 2, 3, 4. Based on standards of care in respiratory therapy, it is best for a participant to decide the rate of their breathing for the technique to be most effective so they feel they are in control (Lawrence Memorial Hospital Respiratory Therapist, Personal communication, 2013). In addition, it was recommended the therapist also be aware of her own breathing pattern because some participants may try to mimic the same rate and this may stress the participants' respiratory system (K. Rollins, personal communication, 2012).

Participants sat comfortably then inhaled through the nose for a count of two and exhaled through pursed lips for a count of four. The therapist used the participant's current breathing rate to demonstrate pursed lip breathing. The therapist demonstrated how to count the inhalation and exhalation for the participant. The participant was asked if they had any questions or needed further demonstration. The participant then demonstrated pursed lip breathing for the therapist. If any additional directions were

necessary, they were given at that point. The participant began pursed lip breathing, and the five minutes began. If the participant stopped, they were prompted to begin again. At the conclusion of the intervention, participants placed the nose clip, forcibly exhaled into a spirometer three times, and completed the Rating of Perceived Exertion Scale and post questionnaire.

**Singing Intervention.** Participants used American folk songs lyrics placed on a music stand. The researcher placed her music on another music stand. The singing intervention is described in Appendix J with music selections described earlier in this chapter. The songs were presented in the following order, from least to most number of verses: *You're A Grand Old Flag*, *This Little Light of Mine*, *When the Saints Go Marching In*, and *This Land Is Your Land*. If any one song was unfamiliar, that song was not used. The researcher gave a starting pitch, with an instrumental introduction, and sang with the participant while accompanying them on guitar. Singing occurred for five minutes with no more than a 20 second break between songs. Each song could be sung more than once to reach the 5-minute limit. If a participant stopped singing, he was prompted to start again unless he felt dizzy or lightheaded. If it took longer than 30 seconds for him to begin again, a 30-minute break was taken before beginning again or terminating the session. At the conclusion of the intervention, participants placed the nose clip, forcibly exhaled into a spirometer three times, and completed the Rating of Perceived Exertion Scale and post questionnaire.

**Kazoo Intervention.** Participants received a new kazoo. Participants were instructed on how to play the kazoo (in case they had forgotten after the initial meeting) and were asked to make a sound (Appendix K). After they had successfully made a

sound on the kazoo, participants were given the lyrics to the songs as a way to keep track of where they were in the song. The music was the same selections as the singing intervention. Participants completed the songs in the following order: *You're A Grand Old Flag*, *This Little Light of Mine*, *When the Saints Go Marching In*, and *This Land Is Your Land*. If the song was unfamiliar, the next song was used. They were instructed to play the kazoo along with guitar accompaniment. The researcher gave the participants the starting pitch on kazoo and gestured to them by raising her eyebrows and simultaneously nodding her head to begin playing the kazoo. The gesture included raising eyebrows and nodding head. The researcher played the kazoo with the participant. Kazoos playing occurred for five minutes with no more than a 20 second break between songs. Each song could be played more than once to reach the 5-minute limit. At the conclusion of the intervention, participants placed the nose clip, forcibly exhaled into a spirometer three times, and completed the Rating of Perceived Exertion Scale and post questionnaire. After the participants completed all three interventions, they ranked the interventions based on which one they found to be the most helpful.

**Treatment Rooms.** All treatment interventions occurred in the member services building on campus at the veteran's home. All paperwork completed by the participants was printed using a 14-point font for easy reading due to the age of the participants. Individual sessions took place in one of two carpeted and wheelchair accessible music rooms located on the first floor of the member services building. Each room has five sides. Room A measures 20'2" x 22'1.5" x 20'2.375" x 11'11"x13'8". Room B measures 19'10.5" x 13'8" x 11'11" x 11'5" x 22'.5". The rooms are accessible by elevator so individuals will not be required to walk down the stairs. The therapist sat to

the right of the participant and within arm's reach to form a 90-degree angle facing inward. This allowed the therapist to observe the client's participation and assist with the lyric sheets as necessary (e.g. turning the page). The participant's back faced the door to avoid any visual distractions of individuals looking in the window. (Home member helpers are assigned to check every room in the building every hour for safety and to count the number of people in each room.) There were two music stands placed in front of the therapist and participant. A table with supplies was parallel to the therapist on her right. This was the room arrangement for all three interventions.

**Music Therapist.** The researcher has been a board certified music therapist since 1997. During her 19 years of clinical practice, she has worked with a variety of people including children with asthma, and people with mental disorders who smoke. She was trained in taking both peak flow meter and spirometer readings by a qualified respiratory therapist and practiced taking spirometer readings for approximately 50 individuals at a health fair.

**Procedures**

**Initial Meeting.** An initial meeting occurred before individuals could participate in the study. This meeting occurred on a different day than the study. Eligibility to participate in the study was determined by completing the Cigarette Dependence Survey 5-item, and by playing the kazoo for the researcher. If the potential participant could not produce a kazoo hum after five attempts, he was not included in the study. After a successful kazoo hum, the individual completed an initial spirometer reading (PEF, $FEV_1$, FVC). After the individual had been successful following directions for the spirometer,

he was given a date and time to return for the study. A reminder was sent the day before the appointment.

**Order of events – Before interventions (on a different day)**

1. Sign Informed Consent
2. Determine eligibility for study ($SpO_2$, CDS-5, kazoo, spirometry PEF, $FEV_1$, FVC)

**Order of events – Day of interventions**

3. Oxygen saturation ($SpO_2$) reading
4. Spirometry x 3 (PEF, $FEV_1$, FVC)
5. Intervention 1 (pursed lip breathing, singing, or kazoo)
6. Spirometry x 3 (PEF, $FEV_1$, FVC), RPE, post questionnaire
7. 30 minute break
8. Spirometry x 3 (PEF, $FEV_1$, FVC)
9. Intervention 2 (pursed lip breathing, singing, or kazoo)
10. Spirometry x 3 (PEF, $FEV_1$, FVC), RPE, post questionnaire
11. 30 minute break
12. Spirometry x 3 (PEF, $FEV_1$, FVC)
13. Intervention 3 (pursed lip breathing, singing, or kazoo)
14. Spirometry x 3 (PEF, $FEV_1$, FVC), RPE, post questionnaire
15. Ranking of all three interventions

*Figure 2*. Order of events within the study

# CHAPTER IV

## RESULTS

For this study, inclusion criteria and informed consent were completed by 15 participants. Of the 15 participants, two people did not appear for their appointment and one person stopped the study after the pursed-lip breathing intervention stating he refused to sing; therefore, twelve participants completed the study ($n$=12). Participants ranged in age from 55-88 years ($M$=67.5, $SD$=9.44). The number of cigarettes smoked by the participants per day ranged from 5-20, ($M$=13.166, $SD$=5.524). This chapter includes results for each of the five research questions.

**Research Question 1:** *Did an individual 5-minute intervention of pursed-lip breathing, singing, or playing kazoo affect lung functioning [as measured by a spirometer]? Was there a difference among interventions?*

Lung functioning was determined from a spirometer using a variety of factors including age, height, and weight to determine whether there was a desired increase in Forced Expiratory Volume at 1 second *$FEV_1$, Forced Vital Capacity* FVC, and Peak Expiraoty Flow PEF. Age, height, and weight impact all three lung functioning tests administered in this study ($FEV_1$, FVC, PEF). The ideal change would be an increase in the lung functioning scores for each test. The mean score shows that lung functioning decreased after the PLB intervention and increased for both music interventions. Some of the changes that occurred for the interventions were minute and may not be considered clinically significant; an example would be participant number one's *$FEV_1$ Score* (Forced Expiratory Volume at 1 second) for pre to post pursed lip breathing (PLB) was only .02 difference. After PLB, 3 participants increased $FEV_1$, while 9 participants decreased.

After singing, 4 participants increased $FEV_1$ and 8 participants decreased. After kazoo, 6 participants increased and 6 participants decreased. Kazoo playing produced an increase for the greatest number of participants. The largest mean change in the desired direction for *$FEV_1$ Score* from pre- to posttest was for kazoo (see Table 1).

Table 1

*$FEV_1$ Scores*

| Participant | Pre PLB | Post PLB | Pre Sing | Post Sing | Pre Kazoo | Post Kazoo |
|---|---|---|---|---|---|---|
| 1 | 2.88 | 2.90 | 2.47 | 2.69 | 2.92 | 2.62 |
| 2 | 1.28 | 1.22 | 1.36 | 1.29 | 1.15 | 1.12 |
| 3 | 1.85 | 1.76 | 2.03 | 1.97 | 1.89 | 1.99 |
| 4 | 2.69 | 1.55 | 2.66 | 1.98 | 2.15 | 2.45 |
| 5 | 2.80 | 2.72 | 2.84 | 2.95 | 2.49 | 2.73 |
| 6 | 2.54 | 2.52 | 2.39 | 2.24 | 2.32 | 2.34 |
| 7 | 2.31 | 2.28 | 2.32 | 2.30 | 2.40 | 2.23 |
| 8 | 1.54 | 1.82 | 1.17 | 2.34 | 1.65 | 1.55 |
| 9 | 3.04 | 3.45 | 3.38 | 3.13 | 2.58 | 3.19 |
| 10 | 2.36 | 2.26 | 2.49 | 2.48 | 2.81 | 3.00 |
| 11 | 1.65 | 1.58 | 1.25 | 1.64 | 1.89 | 1.82 |
| 12 | 2.64 | 2.45 | 2.57 | 2.46 | 2.60 | 2.58 |
| Mean | 2.29 | 2.20 | 2.24 | 2.28 | 2.23 | 2.30 |
| SD | .58 | .64 | .67 | .52 | .51 | .59 |

Table 2 shows the percentage of change for $FEV_1$. Scores with a negative number indicate the individual's lung functioning decreased.

*Table 2*

*FEV1 Percentage of Change*

| | PLB | Singing | Kazoo |
|---|---|---|---|
| 1 | 0.7 | 8.9 | -10.3 |
| 2 | -4.6 | -5.1 | -2.6 |
| 3 | -4.8 | -3.0 | 5.3 |
| 4 | -42.3 | -25.6 | -14.0 |
| 5 | -2.9 | 3.9 | 9.6 |
| 6 | -0.8 | -6.3 | 0.9 |
| 7 | -1.3 | -0.9 | -7.1 |
| 8 | 18.2 | 100.0 | -6.1 |
| 9 | 12.8 | -7.4 | 23.6 |
| 10 | -4.2 | -0.4 | 6.8 |
| 11 | -4.2 | 31.2 | -3.2 |
| 12 | -7.2 | -4.3 | -0.8 |
| Mean | -3.9 | 1.8 | 3.1 |

Results showed that after PLB, 5 participants increased their Peak Expiratory Flow (PEF) while 7 participants decreased. After singing, 10 participants increased PEF and 2 participants decreased. After kazoo playing 8 participants increased PEF and 4 participants decreased. The singing intervention produced an increase in PEF in the greatest number of participants. The largest mean change in the desired direction for *PEF Score* from pre- to posttest was for Singing (see Table 3).

Table 3

*PEF Scores*

| Participant | Pre PLB | Post PLB | Pre Sing | Post Sing | Pre Kazoo | Post Kazoo |
|---|---|---|---|---|---|---|
| 1 | 427 | 594 | 465 | 504 | 580 | 594 |
| 2 | 211 | 166 | 488 | 186 | 153 | 142 |
| 3 | 530 | 360 | 417 | 582 | 377 | 495 |
| 4 | 715 | 195 | 279 | 303 | 278 | 307 |
| 5 | 455 | 404 | 502 | 601 | 401 | 535 |
| 6 | 403 | 485 | 293 | 340 | 595 | 406 |
| 7 | 532 | 399 | 535 | 465 | 503 | 528 |
| 8 | 212 | 214 | 117 | 271 | 230 | 224 |
| 9 | 429 | 435 | 482 | 721 | 540 | 827 |
| 10 | 591 | 353 | 520 | 617 | 503 | 455 |
| 11 | 178 | 200 | 196 | 200 | 215 | 241 |
| 12 | 825 | 597 | 733 | 743 | 856 | 861 |
| Mean | 459 | 366 | 418 | 461 | 435 | 467 |
| SD | 198 | 149 | 169 | 197 | 200 | 224 |

Table 4 shows the percentage of change scores for PEF. Scores with a negative number indicate lung functioning decreased.

*Table 4*

*PEF Percentage of Change Scores*

| | PLB | Singing | Kazoo |
|---|---|---|---|
| 1 | 39.1 | 8.4 | 2.4 |
| 2 | -21.3 | -69.9 | -7.2 |
| 3 | -32.1 | 39.6 | 31.3 |
| 4 | -72.7 | 8.6 | 10.4 |
| 5 | -11.2 | 19.7 | 33.4 |
| 6 | 20.3 | 16.1 | 1.8 |
| 7 | -25.0 | -13.1 | 5.0 |
| 8 | 0.9 | 131.6 | -2.6 |
| 9 | 1.4 | 49.6 | 53.1 |
| 10 | -40.3 | 18.7 | -9.5 |
| 11 | 12.4 | 2.0 | 12.1 |
| 12 | -27.6 | 1.4 | 0.6 |
| Mean | -20.3 | 10.3 | 7.4 |

The results for FVC show that for the PLB intervention, 3 participants increased, 1 participant remained the same, and 8 participants decreased their Forced Vital Capcity. After singing, 8 participants increased, 1 participant stayed the same, and 3 participants decreased. After kazoo playing, 6 participants increased, and 6 participants decreased their FVC. The singing intervention produced an increased FVC in the greatest number of participants. The largest mean change in the desired direction for FVC occurred pre- to posttest for Singing (see Table 5).

Table 5

*FVC Scores*

| Participants | Pre PLB | Post PLB | Pre Sing | Post Sing | Pre Kazoo | Post Kazoo |
|---|---|---|---|---|---|---|
| 1 | 3.81 | 3.47 | 2.92 | 3.63 | 3.12 | 2.87 |
| 2 | 2.83 | 2.49 | 2.70 | 2.59 | 2.58 | 2.26 |
| 3 | 2.51 | 2.30 | 2.60 | 2.65 | 2.55 | 2.64 |
| 4 | 3.72 | 2.34 | 2.66 | 2.70 | 2.84 | 3.39 |
| 5 | 3.42 | 3.42 | 3.50 | 3.61 | 3.00 | 3.27 |
| 6 | 3.75 | 3.60 | 3.73 | 4.02 | 3.81 | 4.29 |
| 7 | 3.33 | 3.29 | 3.16 | 3.16 | 3.40 | 3.12 |
| 8 | 2.51 | 3.20 | 2.84 | 3.57 | 2.58 | 2.44 |
| 9 | 3.98 | 4.57 | 4.38 | 3.97 | 3.22 | 4.06 |
| 10 | 2.93 | 3.12 | 3.03 | 3.08 | 2.81 | 3.00 |
| 11 | 2.59 | 2.39 | 1.89 | 2.52 | 2.95 | 2.72 |
| 12 | 3.27 | 2.96 | 3.15 | 3.37 | 3.33 | 3.31 |
| Mean | 3.22 | 3.09 | 3.04 | 3.23 | 3.01 | 3.11 |
| SD | .53 | .66 | .62 | .53 | .38 | .60 |

Table 6 shows the percentage of change scores. Scores with a negative number indicate the individual's lung functioning decreased.

*Table 6*

*FVC Percentage of Change Scores*

| Participants | PLB | Singing | Kazoo |
|---|---|---|---|
| 1 | -8.9 | 24.3 | -8.0 |
| 2 | -12.0 | -4.1 | -12.4 |
| 3 | -8.4 | -1.9 | 3.5 |
| 4 | -37.1 | -1.5 | 19.4 |
| 5 | 0.0 | -3.1 | -9.0 |
| 6 | -1.3 | 7.8 | 12.6 |
| 7 | -1.2 | 0.0 | -8.2 |
| 8 | 27.5 | 25.7 | -5.4 |
| 9 | 14.8 | -9.4 | 27.8 |
| 10 | 6.5 | -1.7 | 6.8 |
| 11 | -7.7 | 3.3 | -7.8 |
| 12 | -9.5 | 7.0 | -0.6 |
| Mean | -4.0 | 6.3 | 3.3 |

**Research Question 2:** *Was the rating of perceived exertion (RPE) different among pursed-lip breathing, singing, or playing kazoo interventions? How did the rating of perceived exertion compare among the interventions?*

The rating of perceived exertion (RPE) measure ranged from 6-20 with a higher number implying more exertion was perceived (Appendix G). Overall, the RPE was low for each intervention, which means the participants did not perceive a great amount of exertion. Out of the three interventions, the kazoo playing had the highest standard deviation, thus the widest range of exertion scores. Playing the kazoo may have required more exertion for some of the participants than the other two interventions. Four participants rated their perceived effort the same for all three interventions. Three participants rated their effort as lower for the kazoo than for the pursed-lip breathing and singing. Table 7 below shows the RPE scores according to each participant after each of

the three interventions. In the kazoo section there was a rating of "7.5", in this instance, the participant circled the words "Extremely Light" instead of selecting the number seven or eight to represent effort. The researcher chose to record this selection as a 7.5.

Table 7

*Ratings of Perceived Effort Scores*

| Participant | PLB | Singing | Kazoo |
|---|---|---|---|
| 1 | 7 | 7 | 7 |
| 2 | 8 | 8 | 8 |
| 3 | 11 | 11 | 9 |
| 4 | 6 | 6 | 6 |
| 5 | 7 | 7 | 6 |
| 6 | 15 | 14 | 15 |
| 7 | 11 | 9 | 17 |
| 8 | 11 | 13 | 13 |
| 9 | 6 | 9 | 7.5* |
| 10 | 7 | 9 | 13 |
| 11 | 6 | 6 | 6 |
| 12 | 13 | 13 | 12 |
| Mean | 9.00 | 9.33 | 9.95 |
| SD | 3.07 | 2.80 | 3.86 |

*Note: The participant circled the phrase, "extremely light" instead of the number 7 or 8.

**Research Question 3:** *Are participants willing to use pursed-lip breathing, singing, or playing kazoo if it positively impacted their breathing?*

The data for this research question came from the questionnaires the participants completed after each intervention (Appendix H). Question number one on each questionnaire asked "If (intervention) made your breathing better, would you be willing to do it?" and required a yes or no answer. Results for both PLB and Singing were identical. For PLB, 9 participants would be willing to practice pursed-lip breathing if it made their breathing better. Two participants stated they would not be willing to do pursed-lip breathing and 1 participant did not circle an answer on the questionnaire. Nine participants stated they would be willing to sing if it made their breathing better. Only 2

participants stated they would not sing if it made them breathe better, and the same participant as with PLB did not circle an answer on the questionnaire. Results of the post questionnaire for the kazoo intervention indicated that 7 participants would be willing to play kazoo if it made their breathing better but 4 participants stated they would not and a participant crossed out an answer of "no".

**Research Question 4:** *How often per day were participants willing to use pursed-lip breathing, singing, or playing kazoo on their own or with a music therapist?*

When asked questions two and three on the post-intervention questionnaires, "How many times per day would you be willing to practice (intervention) for 5-minutes on your own?" and "How many times per day would you be willing to practice (intervention) for 5-minutes with a music therapist?" participants were instructed to circle a number which ranged from zero to five for each question to indicate the number of times per day (Appendix H). Table 8 illustrates the participant's willingness to participate in the interventions either alone or with a therapist. The questionnaire was given to the participant after each intervention. For PLB, the most frequently chosen answer was three times a day without a music therapist. One participant did not answer the question. When asked about doing the intervention with a therapist, 3 participants selected three times a day.

When asked, "How many times per day would you be willing to practice singing for 5-minutes on your own?" The most frequently chosen answer was three times a day. All participants answered this question. When asked, "How many times per day would you be willing to practice singing for five minutes with a music therapist?" The most common answer was three times a day; 1 participant did not answer the question.

When asked, "How many times per day would you be willing to practice playing kazoo for 5-minutes on your own?" The most frequently chosen answer was three times a day. When asked, "How many times per day would you be willing to practice playing kazoo for 5-minutes with a music therapist?" The most common answer was three times a day. Only 9 participants answered both questions about the kazoo.

Table 8

*Number of times per day willing to carry out the intervention*

| Intervention | Question | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| PLB | On your own? | 0 | 1 | 3 | 4 | 0 | 3 |
| | With a music therapist? | 3 | 2 | 2 | 3 | 0 | 2 |
| Singing | On your own? | 2 | 0 | 2 | 4 | 1 | 3 |
| | With a music therapist? | 2 | 0 | 1 | 4 | 2 | 2 |
| Kazoo | On your own? | 1 | 0 | 2 | 4 | 0 | 2 |
| | With a music therapist? | 1 | 1 | 2 | 3 | 0 | 2 |

**Research Question 5:** *Did the participants think pursed-lip breathing, singing, and playing kazoo improved breathing? Which of the three interventions did the participants think was most helpful?*

Question 4 of the post-intervention questionnaire asked participants if they felt participating in the intervention improved their breathing. When asked, "Do you think pursed-lip breathing improved your breathing?" Six participants selected yes and 5 selected no with 1 participant wrote a question mark. When asked, "Do you think singing improved your breathing?" Ten participants selected "yes" and two selected "no." When asked, "Do you think playing kazoo improved your breathing?" Eight participants selected yes and 4 selected no. Six participants indicated that all three interventions improved their breathing.

After completing all three interventions and the post intervention questionnaire, participants were verbally asked to rank the interventions from most helpful to least helpful for their breathing. "Rank the three activities in order from most helpful to least helpful for your breathing." Each intervention was ranked first by 4 participants each. Singing and kazoo was each ranked second by 5 participants. Pursed-lip breathing was ranked second by 2 participants. Pursed-lip breathing was ranked third, or least helpful by 6 participants while both singing and kazoo playing was ranked third by only 3 participants each. Figure 3 appears to indicate that participants found singing and kazoo playing somewhat equally effective.

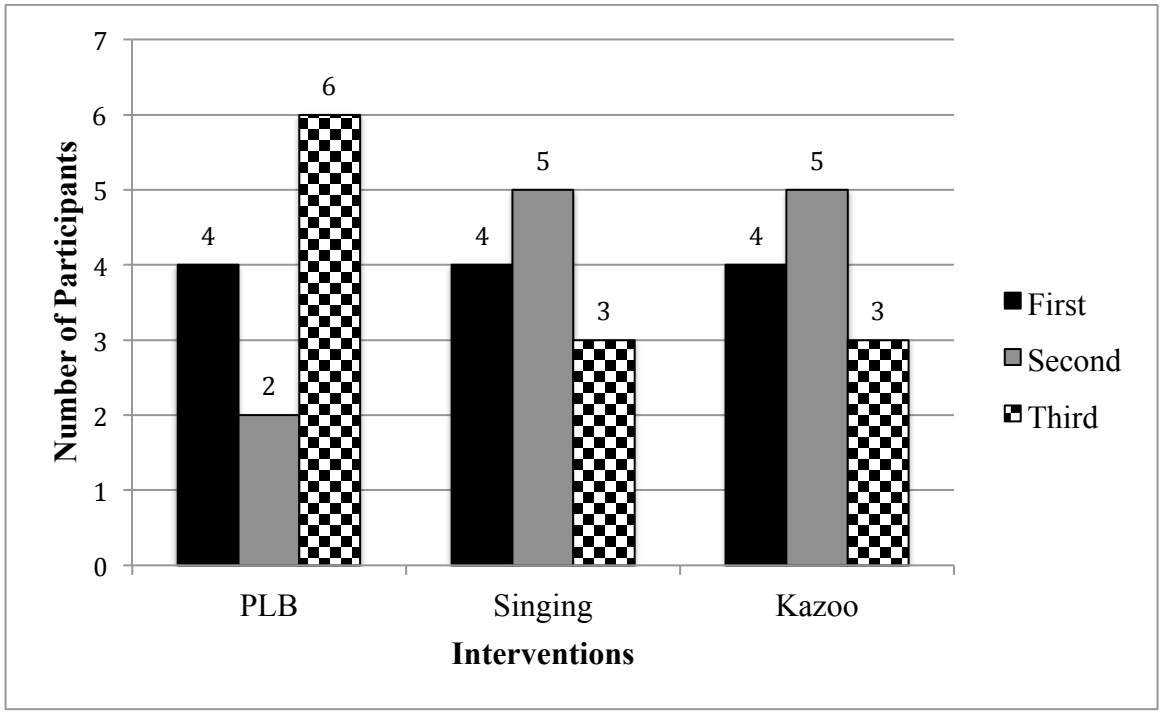


*Figure 3.* Rankings of Interventions by Participants

# CHAPTER V

# DISCUSSION

COPD is a progressive lung disease frequently caused by years of smoking. The decrease in lung functioning can be attributed to damage done to the alveolar making it difficult to exhale carbon dioxide from the lungs. This study utilized participants who continue to smoke and either do not have COPD or have an early stage of COPD, but are not undergoing active treatment. The purpose of this study was to examine (a) if lung functioning changes occurred after a 5-minute session of pursed lip breathing, singing, or kazoo playing in individuals with a history of smoking, (b) if there is perceived physical exertion after each intervention, and how exertion compares among interventions, (c) if participants would choose to engage in these interventions either alone or with a therapist. This appears to be the only study in music therapy research that serves to identify what changes in lung functioning occur with a brief intervention.

This chapter focuses on lung functioning, rate of perceived exertion, and willingness to participate, as these were the foci of the research questions. The treatment interventions, song selection, participants, and limitations are discussed before moving onto clinical implications and future research.

## Lung Functioning

Lung functioning measures did not increase for each individual from pre- to posttest, which is similar to the results of other studies (Anderson, 2012; Engen, 2005; Lord et al., 2010). While the mean scores trended toward an increase in lung function, it appears that some individuals experienced a worsening of lung functioning immediately after the interventions. Several factors may have impacted a lack of improvement after

the interventions. A five-minute intervention starting with 120 beats per minute may be too fast to have a positive impact on lung functioning. It may be necessary to contour the session by decreasing the tempo of the music in order to increase to 120 beats per minute. Thus, a five-minute intervention may not be long enough for each participant to experience improvement.

Lung functioning measures occurred immediately after the intervention when individuals may have already been exhausted from pursed-lip breathing, singing, or playing kazoo. After completing the interventions, it is possible that they were too tired to forcibly blow through the spirometer. Potentially, benefits may occur shortly after the intervention and not immediately following. Possibly waiting a few minutes after the intervention and taking an additional might be necessary to see an improvement in results.

**Rate of Perceived Exertion**

Exertion is defined as breathlessness or strain on the muscles according to the RPE measure with responses ranging from 6 to 20. The results of the RPE after each intervention were within one point of each other with ratings of 9.00 for PLB, 9.33 for singing, and 9.95 for kazoo. The anticipated results were that individuals would rate kazoo playing as the highest rate of exertion followed by singing and than pursed-lip breathing. Playing the kazoo required a lot of air to maintain the sound and participants appeared to be breathing deeply. Half of the participants arbitrarily stated they felt as if they needed to catch their breath after the kazoo intervention. Even though participants stated they felt winded because of the kazoo, they did not report feeling overly exerted by playing the kazoo.

**Willingness to Participate**

This study addressed how often per day an individual would be willing to participate in the intervention with and without a music therapist present. Whether they complete the intervention with or without a music therapist, three times a day was the most frequently reported answer for the interventions. This may be a convenient number of times and associated with meal times, which occur three times a day. More than three times a day may be a hindrance to their schedule. Those who selected three times a day may also enjoy active music engagement more than others. With the exception of PLB on their own, some participants selected that they would choose to carry out the intervention zero times a day regardless of if they were left to complete it alone or with a music therapist.

According to the questionnaire, participants did not necessarily want a music therapist present for the daily interventions. Having a therapist present could be viewed as a loss of independence. Based on clinical experience, the men at the veterans home are frequently concerned that they may need additional assistance, sometimes to their detriment. It is unknown if they would follow through and carry out the interventions without a therapist present.

**Treatment Interventions**

PLB is used in pulmonary rehabilitation to assist an individual in controlling how they breathe. The purpose of PLB is to assist the individual in exhaling carbon dioxide, thus the inhalation is shorter than the time for exhalation. Practicing pursed-lip breathing has been shown to be helpful before engaging in movement that may cause exertion, and

thus interrupt inefficient breathing (Spahija et al., 2005). None of the participants had been instructed in PLB before the study and 2 participants had difficulty understanding the protocol. A brief demonstration helped and both participants complied with the directions. The researcher also did PLB during the 5-minute intervention with the participants. Early on in the study, a participant commented on the perceived long length of time elapsed during the PLB. This led the researcher to inform the participants how much time had passed in the 5-minutes. The amount of time remaining was given at the halfway point, 1 minute left, and 30 seconds left. The goal was to avoid having the participants speak when they were supposed to be doing pursed-lip breathing. Only two participants stopped the pursed-lip breathing briefly (less than 10 seconds) and needed a verbal prompt to continue.

During the singing intervention, one individual changed his mind and refused to participate. When asked why, he stated, "I don't sing, ever." He was asked once if he would reconsider. He was adamant he would not sing and was thanked for his time and allowed to leave. Several participants appeared apprehensive about singing until they were told that the researcher would be singing with them while accompanying them on the guitar. This appeared to put them at ease. None of the remaining participants made any negative statements about singing and appeared to put forth adequate effort during the intervention.

During the kazoo intervention, each participant was given a new, clean kazoo to play. When presented with the kazoo, 11 of the participants immediately put it in their mouths and began making sounds, bobbing their heads as they played. As soon as they were done playing the kazoo, a frequent statement was "I don't like the kazoo." This

comment was incongruent with how they initially behaved and their facial expressions. It may be that the kazoo was viewed as a toy because several of the participants stated they owned a kazoo when they were younger. All the participants complied by playing for 5-minutes. A few participants commented that the kazoo required a lot of air and they appeared winded after playing.

Participants showed a preference for singing and kazoo playing over PLB after each intervention occurred. When asked which intervention was most helpful for breathing, they were ranked similarly, which was unexpected. It was expected that participants would select one of the music interventions over PLB.

**Song Choices**

The researcher chose the songs for the study because they are frequently sung at the veterans home in a variety of groups and gatherings, and therefore would be familiar to most participants. In this study, the researcher attempted to control the music by taking into consideration phrasing, melody, tempo, and potential knowledge of the songs. Previous knowledge of the songs meant the researcher did not need to teach the music and a prior familiarity might have increased confidence in singing. There were two different times when an individual did not know one of the songs; therefore, that song (*This Little Light of Mine*) was skipped over while another song was repeated instead. This change filled the same overall amount of time and occurred for both music interventions. One of the participants referred to the songs as "crap" and specifically asked, "Where are the Willie Nelson songs?" This participant was asked if he was willing to sing and play any of the song choices and he selected *When the Saints Go Marching In* and *This Land Is Your Land*. The oldest participant stated he enjoyed the

song choices and tapped his feet alternating left and right to each tune. Nine of the twelve participants made a comment about the New Orleans Saints football team when they saw the song, *When the Saints Go Marching In*. Ideally, participants would have more songs to choose from that fit the parameters and not feel they were limited to singing and playing pre-selected songs, especially when they did not care for a particular song or songs. As in any treatment where the participant needs to be fully engaged it would be ideal for them to self-select the music they would like to sing, however that may not always be possible.

**Participant Characteristics**

Various characteristics may have potentially impacted the study. Participants who completed this study had an additional connection to the facility via a specialized program. All the participants were engaged in either a facility program where they knew the researcher from music therapy or they were employed on campus as a home member helper. These individuals saw their role as being helpful by participating in the study; this may have been an unintended bias. The individual, who volunteered and dropped out at the beginning of the study due to singing, was not a part of either a campus program or a home member helper program.

Pre-screening ensured potential participants did not live in licensed care, could follow directions, and did not demonstrate memory problems. Once pre-screening was complete, participants could begin the study immediately. Licensed care is a part of the home where individuals are under direct supervision of an interdisciplinary team and must be assessed before determining what activities they are allowed to participate. It is not always obvious if an individual lives in licensed care, as they are free to move around

the campus. The pre-screening did function in the intended capacity and identified a licensed care individual who was willing to complete the study; yet, that individual was not allowed to participate.

Smoking habits varied in number of cigarettes smoked per day. All of the participants began smoking in their teenage years; therefore, it is possible that smoking may have already damaged their lungs. One participant explained how the military used cigarettes as a reward for completing difficult tasks and the men looked forward to smoking. Nine of the participants spontaneously spoke about attempting to quit smoking with little to no success and no desire to attempt it again.

**Limitations**

There were several limitations in this study; they are listed here and will be expanded upon in subsequent paragraphs:

- Recruitment process yielded a small number of participants;
- Difficult to recruit people who smoke;
- No limitations on smoking before the study;
- Participants did not know always know if they had COPD;
- Pursed-lip breathing and kazoo playing required additional explanation and demonstration;
- Post-intervention questionnaire required rearranging for clarity;
- Use of a spirometer was a new experience for several participants;
- Study did not measure affect.

Recruitment was minimally successful. At the veterans home, each building receives fliers to be displayed detailing campus information. Although the flyers were sent to the residences promptly, they may not be placed on the bulletin board immediately and not everyone chooses to read them regularly. Different recruitment methods such as sending the flyers directly to potential participants may have increased

the number of participants for the current study. It may have helped recruitment if the participants were paid.

As stated by a participant, people who smoke may choose to skip participating because they do not want to be lectured. Even with reassurance, they may think they will be judged and lectured on their smoking habits and will avoid participating. This may have lead to the small number of participants choosing to take part in the study.

This study did not require the participants to avoid cigarettes before the study. Instructions about smoking were not given before the study; thus, participants were allowed to smoke before their appointment. Some of the participants chose to smoke before the study, as some of them smelled heavily of cigarettes. This may have impacted their ability to breathe and altered the lung functioning scores. However, some of the participants may have chosen to smoke before their appointment because they knew that the study would take an hour and half of their time or they were nervous.

Some participants did not know if they had Chronic Obstructive Pulmonary Disease. Although having the beginning stages of COPD would not have restricted their participation, individuals who used oxygen and appeared to have shortness of breath as noted by labored breathing, were excluded from the study. Information about severity of COPD was not collected. Of the twelve participants, 4 stated they were diagnosed with COPD. When they were asked about the severity of the illness, participants were unable to give any specific information. Frequent answers to the severity of the illness included, "I don't know. They just gave me an inhaler if I need it." Two other participants were unaware of what COPD is or if they were diagnosed with the illness, however, they reported having an emergency inhaler.

Both pursed-lip breathing and kazoo playing required several minutes of instruction for some of the participants. During pursed-lip breathing, 2 individuals required prompts to purse their lips. One participant did not appear to understand what "pursed-lip breathing" referred to on the questionnaire and wrote in two question marks for his answer. One individual attempted to continue pursed-lip breathing through the kazoo and had difficulty coordinating making a sound while the kazoo was in his mouth, which required redirection. He was successful after three attempts.

The post-intervention questionnaire should have been reordered to ask if they felt the intervention helped their breathing first instead of last. In the current order, participants are led to answer questions that may not apply. Although zero number of times was a choice, some participants chose a number even though they stated they would not be willing to participate.

Using the spirometer was a new experience for over half of the participants. Several of the participants were familiar with using an incentive spirometer that is used in treatment for a respiratory illness. An incentive spirometer is a plastic device with a small ball in it, the goal is to blow into the device and keep the ball airborne at a specific height for a certain amount of time. The spirometer used for the study was digital and does not give visual cues to the participant. Also, the spirometer used in the study required that you keep the mouthpiece in your mouth while you breathe regularly before exhaling forcibly. A couple of participants removed the mouthpiece while breathing regularly, but put it back in their mouth when prompted. There was a learning curve in using the device and some of the participants were able to use it with better results than others. Eventually, all the participants were using the device appropriately.

This study did not address the affect of the participant. This may be an important factor to add to any study dealing with an illness, especially one where the individual gets progressively worse causing he or she to isolate from others and become depressed or anxious (Quint et al., 2008; Zhang et al., 2011). While PLB, singing, and kazoo playing may not lead to better breathing for everyone, it may assist with how an individual views their illness.

**Clinical Implications**

There are several clinical implications for this study including the physicality of playing or singing, participant's view of the kazoo, and worrying about singing in front of someone. Once those issues have been addressed, the main focus of the intervention should be exhalation.

Clinicians who have studied music for years may forget how much air it takes to sing or play an instrument. For the individual who has damaged lungs, both singing and kazoo playing may be physically taxing. This may require recovery time after singing or playing. The individual may not make it through a traditionally timed session such as thirty minutes or may require frequent breaks.

The kazoo can be a functional instrument to use in working with individuals; however, some may view it as a toy and be less inclined to participate in the treatment. Asking if the individual would be willing to play a kazoo may give them some control over the treatment. The kazoo may also require more air than singing depending on how wide an individual opens their mouth. Playing the kazoo may be more difficult for individuals with more severe COPD. When engaging an individual, it may be helpful if they therapist plays the kazoo along with the individual.

Other instruments may provide benefits for individuals. Giving an individual their preferred instrument to work with such as harmonica or melodica may increase their interest.

Individuals have different singing experiences. Some people do not like singing solos, unless they have sung in the past and have some confidence. In order to assist an individual through singing, it may be useful to sing along, so they do not feel they are being listened to or judged for their voice.

The focus of treatment for COPD should be exhaling. The exhalation is the process of removing the old air, which is trapped in the lungs. By singing and playing kazoo, an individual will be forcing air from their lungs and making room for oxygen to enter. Exhalation should be practiced so that individuals know how to control their breath and how to recover when it becomes difficult. In this study, phrasing was selected because it made the participants exhale for a specific amount of time and only gave room for a brief inhalation. The individuals required some recovery time, but they did recover.

**Future Research**

Music therapists use singing regularly as an intervention for a variety of populations. The music therapy research examining singing and COPD is limited. Future research should include attempting to run the study again with a larger number of participants and implementation of a smoking prohibition of approximately one hour prior to the session. This study had only male participants due to the population of the facility. Running a study with all female or both male and female participants may demonstrate different trends.

The purpose of this study was to examine how a brief intervention would impact lung function, and exertion as well as determine how often an individual would be willing to carry out the intervention. Using the information gained in this study, an intervention should be developed that is brief but occurs three times a day according to the information acquired from the post-intervention questionnaire. It may be informative to have the intervention done with and without a music therapist present to also examine follow through by the individual. Although the brief intervention did not provide the desired results, future research should include continuing to look at short periods of singing over multiple sessions per day. It may be helpful to allow the participant to choose an instrument. Letting them use their preferred instrument (i.e., voice or kazoo) may increase willingness to carry out the interventions alone.

Future research should explore giving participants more songs to choose from that follow the same form used in this study. Additionally, future research could examine how allowing participants to choose the songs used in the interventions affects both willingness to carry out interventions and perceptions of their effectiveness. This may assist individuals in individually caring out their treatment without a therapist present.

**Conclusion**

This study was conducted to examine a brief intervention that could potentially be used by individuals to increase their lung functioning and to ascertain if they would be willing to carry them out. Individuals with COPD frequently use PLB in order to gain control of their breathing before engaging in movement or to recover from a physically exerting activity. PLB is the current standard of care. This study demonstrated that a 5-

minute music-based intervention (singing or kazoo playing) could be used to increase lung functioning.

## References

Agh, T., Inotai, A., & Meszaros, A. (2011). Factors associated with medication adherence in patients with chronic obstructive pulmonary disease. *Respiration, 82*, 328-334. doi:10.1159/000324453

Alexander, J.L., & Wagner, C.L. (2012). Is harmonica playing an effective adjunct therapy to pulmonary rehabilitation? *Rehabilitation Nursing*, *37*(4), 207-212. doi: 10.1002/rnj.33

American Lung Association (2013). How serious is COPD? Retrieved from website http://www.lung.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html

American Thoracic Society (2015). What kind of medications are there for COPD? Retrieved from website https://www.thoracic.org/copd-guidelines/for-patients/what-kind-of-medications-are-there-for-copd/what-are-corticosteroid-anti-inflammatory-medications.php

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing.

Anderson, L. (2012). *The use of singing and playing wind instruments to enhance pulmonary function and quality of life in children and adolescents with cystic fibrosis* (Unpublished Master's thesis). University of Kansas, Lawrence, Kansas.

Axen, K., Haas, F. & Thornby, M.A. (1995). Effect of distractive auditory stimuli on exercise tolerance in patients with COPD. *Chest,107*(5), 1213-1217. doi:10.1378/chest.107.5.1213

Bender, B.G. (2012). Nonadherence to COPD treatment: What have we learned and what do we do next? *Journal of Chronic Obstructive Pulmonary Disease, 9*, 209-210. doi:10.3109/15412555.679880

Bianchi, R., Gigliotti, F., Romagnoli, I., Lanini, B., Castellani, C., Binazzi, B., … & Scano, G. (2007). Patterns of chest wall kinematics during volitional pursed-lip breathing in COPD at rest. *Respiratory Medicine, 101*, 1412-1418. doi:10.1016/j.rmed.2007.01.021

Bonilha, A.G., Onofre, F., Vieira, M.L., Prado, M.Y.A., & Martinez, J.A.B. (2009). Effects of singing classes on pulmonary function and quality of life of COPD patients. *International Journal of COPD, 4*, 1-8. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2672787/

Borg, G.A. (1982). Psychophysical bases of perceived exertion. *Medicine and Science in Sports Exercise, 14*, 377-381. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7154893

Borge, C.R., Mengshoel, A.M., Omenaas, E., Moum, T., Ekman, Lein, M.P., … & Wahl, A.K. (2015). Effects of guided deep breathing on breathlessness and the breathing pattern in chronic obstructive pulmonary disease: A double-blind randomized control study. *Patient Education and Counseling, 98*, 182-190. doi:10.1016/j.pec.2014.10.1017

Burri, P.H. (2006). Structural aspects of postnatal lung development-alveolar formation and growth. *Biology of the Neonate*, *89*, 313-322. doi:10.1159/000092868

Chan, A.W.K., Lee, A., Suen, L.K.P., & Tam, W.W.S. (2011). Tai Chi Qigong improves lung functions and activity tolerance in COPD clients: A single blind, randomized controlled trial. *Complementary Therapies in Medicine, 19*, 3-11. doi:10.1016/j.ctim.2010.12.007

Chee, A. & Sin, D.D. (2008). Treatment of mild chronic obstructive pulmonary disease. *International Journal of COPD, 3*(4), 563-573. PMC2650603

Chee, C., Sellahewa, L., & Pappachan, J.M. (2014). Inhaled corticosteroids and bone health. *The Open Respiratory Medicine Journal, 8*, 85-92. doi: 10.2174/1874306401408010085

Chen, K.H., Chen, M.L., Lee, S., Cho, H.Y., & Wen, L.C. (2008). Self-management behaviours for patients with chronic obstructive pulmonary disease: A qualitative study. *Journal of Advanced Nursing, 64*(6), 595-604. doi:10.1111/j.1365-2648.2008.04821.x

Clark, D.M. (1986). A cognitive approach to panic. *Behaviour Research and Therapy*, *24*(4), 461-470. doi:10.1016/0005-7967(86)90011-2

Centers for Disease Control (2014). Data and statistics. Retrieved from http://www.cdc.gov/copd/index.html

Cohan, G.M. (2000). You're A Grand Old Flag. In Music Educators National Conference (Ed.), Get American Singing…Again! Volume 2. Milwaukee: Hal Leonard. (Original work published 1906)

Donesky-Cuenco, D., Nguyen, H.Q., Paul, S., & Carrieri-Kohlman, V. (2009). Yoga therapy decreases dyspnea-related distress and improves functional performance In people with chronic obstructive pulmonary disease: A pilot study. *The Journal of Alternative and Complementary Medicine, 15* (3), 225-234. doi:10.1089/acm.2008.0389

Eley, R., & Gorman, D. (2010). Didgeridoo playing and singing to support asthma management in aboriginal Australians. *The Journal of Rural Health*, *26*, 100-104. doi: 10.1111/j.1748-0361.2009.00256.x

Engen, R. (2005). The singer's breath: Implications for treatment of persons with emphysema. *Journal of Music Therapy, 42*(1)*,* 20-48. *doi: 10.1093/jmt/42.1.20*

Etter, J.F., Le Houezec, J., & Perneger, T.V. (2003). A self-administered questionnaire to measure dependence on cigarettes: The cigarette dependence scale. *Neuropsychopharmacology, 28*, 359-370. doi:10.1038/sj.npp.1300030

Faager, G., Ståhle, A., & Larsen, F.F. (2008). Influence of spontaneously pursed lips breathing on walking endurance and oxygen saturation in patients with moderate to severe chronic obstruction pulmonary disease. *Clinical Rehabilitation*, *22,* 675-683. doi: 10.1177/0269215508088986

Gavish, B. (2010). Device-guided breathing in the home setting: Technology, performance and clinical outcomes. *Biological Psychology, 84*, 150-156. doi:10.1016/j.biopsycho.2010.02.013

Global Initiative for Chronic Obstructive Lung Disease (GOLD) (2015). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Retrieved from http://www.goldcopd.org/Guidelines/guidelines-resources.html

Gratziou, C., Florou, A., Ischaki, E., Eleftheriou, K., Sachlas, A., Bersimis, S., & Zakynthinos, S. (2014). Smoking cessation effectiveness in smokers with COPD and asthma under real life conditions. *Respiratory Medicine, 108*, 577-583. doi:10.1016/j.rmed.2014.01.007

Gurney-Smith, B., Cooper, M.J., & Wallace, L.M. (2002). Anxiety and panic in chronic obstructive pulmonary disease: The role of catastrophic thoughts. *Cognitive Therapy and Research, 26*(1)*,* 143-155. doi: 10.1023/A:1013854023665

Guthrie, W. (1996). This Land Is Your Land. In Music Educators National Conference (Ed.), Get American Singing…Again! Volume 1. Milwaukee: Hal Leonard. (Original work published 1940)

Hallas, C.N., Howard, C., Theadom, A., & Wray, J. (2012). Negative beliefs about breathlessness increases panic for patients with chronic respiratory disease. *Psychology, Health & Medicine, 17*(4), 467-477. http://dx.doi.org/10.1080/13548506.2011.626434

Harding, R., & Maritz, G. (2012). Maternal and fetal origins of lung disease in adulthood. *Seminars in Fetal & Neonatal Medicine, 17*, 67-72. doi:10.1016/j.siny.2012.01.005

Hayton, C., Clark, A., Olive, S., Browne, P., Galey, P., Knights, E., Stauton, L., …Wilson, A.M. (2013). Barriers to pulmonary rehabilitation: Characters that predict patient attendance and adherence. *Respiratory Medicine, 107*, 401-407. doi:10.1016/j.rmed.2012.11.016

Huetsch, J.C., Uman, J.E., Udris, E.M., & Au, D.H., (2012). Predictors of adherence to inhaled medications among veterans with COPD. *Journal of General Internal Medicine, 27*(11), 1506-1512. doi: 10.1007/s11606-012-2130-5

Johnson, G., Kong, D.C.M., Thoman, R., & Stewart, K. (2005). Factors associated with medication nonadherence in patients with COPD. *Chest, 128*(5) 3198-3204. doi:10.1378/chest.128.5.3198

Jones, A.Y.M., Dean, E., & Chow, C.C.S. (2003). Comparison of the oxygen cost of breathing exercises and spontaneous breathing in patients with stable chronic obstructive pulmonary disease. *Physical Therapy, 83*(5), 424-431. Retrieved from http://ptjournal.apta.org/content/83/5/424

KajeKar, R. (2007). Environmental factors and developmental outcomes in the lung. *Pharmacology & Therapeutics, 114*, 129-145. doi:10.1016/j.pharmthera.2007.01.011

Kaneko, Y., Yatagai, Y., Yamada, H., Iijima, H., Masuko, H., Sakamoto, T., & Hizawa, N. (2013). The search for common pathways underlying asthma and COPD. *International Journal of COPD, 8*, 65-78. doi:10.2147/COPD.S39617

Kessler, R., Stahl, E., Vogelmeier, C., Haughney, J., Trudeau, E., Lofdahl, C.G., & Partridge, M.R. (2006). Patient understanding, detection, and experience of COPD exacerbations: An observational, interview-based study. *Chest,130*(1), 133-142. doi:10.1378/chest.130.1.133

Khdour, M.R., Hawwa, A.F., Kidney, J.C., Smyth, B.M., & McElnay, J.C. (2012). Potential risk factors for medication non-adherence in patients with chronic obstructive pulmonary disease (COPD). *European Journal of Clinical Pharmacology,online.* doi:10.1007/s00228-012-1279-5

Leon, A.C., Davis, L.L., & Kraemer, H.C. (2011). The role and interpretation of pilot studies in clinical research. *Journal of Psychiatric Research, 45*(5), 626-629. doi:10.1016/j.jpsychires.2010.10.008

Liou, T.G., & Kanner, R.E. (2009). Spirometry. *Clinical Review of Allergy and Immunology*, *37*, 137-152. doi:10.1007/s12016-009-8128-z

Livermore, N., Sharpe, L., & McKenzie, D. (2010). Panic attacks and panic disorder in chronic obstructive pulmonary disease: A cognitive behavioral perspective. *Respiratory Medicine, 104*, 1246-1253. doi:10.1016/j.rmed.2010.04.011

Livermore, N., Sharpe, L., & McKenzie, D. (2012). Catastrophic interpretations and anxiety sensitivity as predictors of panic-spectrum psychopathology in chronic obstructive pulmonary disease. *Journal of Psychosomatic Research*, *72*, 388-392. doi:10.1016/j.psychores.2012.02.001

Lord, V.M., Cave, P., Hume, V.J., Flude, E.J., Evans, A., Kelly, J.L., … & Hopkinson, N.S. (2010). Singing teaching as a therapy for chronic respiratory disease – A randomized controlled trial and qualitative evaluation. *BMC Pulmonary Medicine*, *10*(41). doi:10.1186/1471-2466-10-41

National Institutes of Health (2014). Lung disease. Retrieved from website https://www.nlm.nih.gov/medlineplus/ency/article/000066.htm

National Jewish Center (2009). Breathing retraining: Pursed Lip Breathing. Retrieved from http://www.nationaljewish.org/healthinfo/conditions/copd-chronic-obstructive-pulmonary-disease/lifestyle-management/breathing-retraining

Maestrelli, P., Richeldi, L, Moretti, M., & Fabbri, L.M. (2001). Analysis of sputum in COPD. *Thorax*, 56, 420-422. doi:10.1136/thorax.56.6.420

Mahler, D.A., Ward, J., Waterman, L.A., & Baird, J.C. (2012). Longitudinal changes in patient-reported dyspnea in patients with COPD. *Journal of Chronic Obstructive Pulmonary Disease, 9*, 522-527. doi:10.3109/15412555.2012.701678

Makela, M.J., Backer, V., Hedegaard, M., & Larsson, K. (2013). Adherence to inhaled therapies, health outcomes and costs in patients with asthma and COPD. *Respiratory Medicine*, *107*, 1481-1490. doi:10.1016/j.rmed.2013.04.005

Miravitlles, M., de la Roza, C., Naberan, K., Lamban, M., Gobartt, E., Martin, A., & Chapman, K.R. (2006). Attitudes toward the diagnosis of chronic obstructive pulmonary disease in primary care. *Archivos de Bronconeumologia, 42*(1), 3-8. doi:10.1016/S1579-2129(06)60106-7

Monteagudo, M., Rodriguez-Blanco, T., Llagostera, M., Valero, C., Bayona, X., Ferrer, M., & Miravitlles, M. (2013). Factors associated with changes in quality of life of COPD patients: A prospective study in primary care. *Respiratory Medicine, 107*, 1589-1597. doi:10.1016/j.rmed.2013.05.009

Murata, G.H., Kapsner, C.O., Lium, D.J., & Busby, H.K. (1998). Patient compliance with peak flow monitoring in chronic obstructive pulmonary disease. *American Journal of Medical Science*, *315*(5), 296-301. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9587085

Omachi, T.A., Blanc, P.D., Claman, D.M., Chen, H., Yelin, E.H., Julian, L., & Katz, P.P. (2012). Disturbed sleep among COPD patients is longitudinally associated with mortality and adverse COPD outcomes. *Sleep Medicine,* 13, 476-483. doi:10.1016/j.sleep.2011.12.007

Owens, R.L., & Malhotra, A. (2010). Sleep disordered breathing and COPD: The overlap syndrome. *Respiratory Care, 55*(10), 1333-1344. http://www.rcjournal.com/contents/10.10/10.10.1333.pdf

Plaufcan, M.R., Wamboldt, F.S., & Holm, K.E. (2012). Behavioral and characterological self-blame in chronic obstructive pulmonary disease. *Journal of Psychosomatic Research*, *72*, 78-83. doi:10.1016/j/jpsychores.2011.10.004

Price, D., Freeman, D., Cleland, J., Kaplan, A., & Gerasoli, F. (2011). Earlier diagnosis and earlier treatment of COPD in primary care. *Primary Care Respiratory Journal, 20*(1), 15-22. doi:10.4104/pcrj.2010.00060

Qian, J., Simoni-Wastila, L., Rattinger, G.B., Zuckerman, I.H., Lehmann, S., Wei, Y.J.J., & Stuart, B. (2014). Association between depression and maintenance medication adherence among Medicare beneficiaries with chronic obstructive pulmonary disease. *International Journal of Geriatric Psychiatry, 29*, 49-57. doi:10.1002/gps.3968

Quint, J.K., Baghair-Ravary, R., Donaldson, G.C., & Wedzicha, J.A. (2008). Relationship between depression and exacerbations in COPD. *European Respiratory Journal, 31*(1), 53-60. doi: 10.1183/09031936.00120107

Ratnovsky, A., Elad, D., & Halper, P. (2008). Mechanics of respiratory muscles. *Respiratory Physiology & Neurobiology*, *163*, 82-89. doi:10.1016/j.resp.2008.04.019

Ray, S.M., & Stevens, A.R.B. (2013). Choosing the right inhaled medication device for COPD. *American Family Physician, 88*(10), 651-652. PMID:24364480

*The respiratory system* [Video file]. (2009). In *Films On Demand*. Retrieved January 7, 2014, from fod.infobase.com/PortalPlaylists.aspx?wID=104680&xtid=39508

Roche, N., Chavannes, N.H., & Miravitlles (2013). COPD symptoms in the morning: Impact, evaluation and management. *Respiratory Research*, *14*, 112-119. doi:10.1186/1465-9921-14-112

Singh, V.P., Rao, V., Prem, V., Sahoo, R.C., & Keshav, P.K. (2009). Comparison of the effectiveness of music and progressive muscle relaxation for anxiety in COPD – A randomized controlled pilot study. *Chronic Respiratory Disease, 6*(4), 209-216. doi: 10.1177/1479972309346754

Smith, J., & Woodcock, A. (2006). Cough and its importance in COPD. *International Journal of Chronic Obstructive Pulmonary Disease, 1*(3), 305-314. http://www.ncbi.nlm.nih.gov/pubmed/?term=PMC2707150

Smith, J.A. & Calverley, P.M.A. (2004). Cough in chronic obstructive pulmonary disease. *Pulmonary Pharmacology & Therapeutics, 17*(6), 393-398. doi:10.1016/j.pupt.2004.09.006

Soriano, J.B., Zielinski, J., & Price, D. (2009). Screening for and early detection of chronic obstructive pulmonary disease. *The Lancet, 374*, 721-732. doi:10.1016/S0140-6736(09)61290-3

Spahija, J., de Marchie, M., & Grassino, A., (2005). Effects of imposed pursed-lips breathing on respiratory mechanics and dyspnea at rest and during exercise in COPD. *Chest*, *128*, 640-650. doi:10.1378/chest.128.2.640

Spirometry testing (lung function test) (2013). Retrieved from http://www.nationaljewish.org/programs/tests/pulmonary-physiology/pulmonary-function/spirometry/

Stocks, J., Hislop, A. & Sonnappa, S. (2013). Early lung development: Lifelong effect on respiratory health and disease. *The Lancet*, *1*(9), 728-742. doi:10.1016/S2213-2600(13)70118-8

Stockley, R.A. (2014). Alpha 1-antitrypsin review. *Clinics Chest Medicine, 35*, 39-50. http://dx.doi.org/10.1016/j.ccm.2013.10.001

Sumner, H., Woodcock, A., Kolsum, U., Dockry, R., Lazaar, A.L., Singh, D., Vestbo, J., & Smith, J.A. (2013). Predictors of objective cough frequency in chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine*, 187(9), 943-949. doi: 10.1164/rccm.201211-2000OC

Tashkin, D., & Murray, R.P. (2009). Smoking cessation in chronic obstructive pulmonary disease. *Respiratory Medicine, 103*(7), 963-974. doi:10.1016/j.rmed.2009.02.013

Thabane, M., & COPD Working Group (2012). Smoking cessation for patients with chronic obstructive pulmonary disease. *Ontario Health Technology Assessment Service, 12*(4), 1-50. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3384371/

Traditional (2000). When The Saints Go Marching In. In Music Educators National Conference (Ed.), Get American Singing…Again! Volume 2. Milwaukee: Hal Leonard. (Original work published c. 1900)

Traditional (1996). This Little Light of Mine. In Music Educators National Conference (Ed.), Get American Singing…Again! Volume 1. Milwaukee: Hal Leonard. (Original work published 1939)

Troosters, T., Demeyer, H., Hornikx, M., Camillo, C.A., & Janssens, W. (2014). Pulmonary rehabilitation. *Clinical Chest Medicine, 35*, 241-249. doi.org/10.1016/j.ccm.2013.10.006

Tsai, C.L., Brenner, B.E., & Camargo Jr., C.A. (2007). Circadian-rhythm differences among emergency department patients with chronic obstructive pulmonary disease exacerbation. *Chronobiology International, 24*(4), 699-713. doi:10/1080/07420520701535753

Twyman, L., Bonevski, B., Paul, C., & Bryant, J., (2014). Perceived barriers to smoking cessation in selected vulnerable groups: a systematic review of the qualitative and quantitative barriers. *BMJ Open, 4*(12), 1-16. doi:10.1136/bmjopen-2014-006414

U.S. Environmental Protection Agency (2015). Particulate matter. (2015). Retrieved from website http://www3.epa.gov/airquality/particlepollution/

van Helvoort, H.A., de Boer, R.C., van de Broek, L., Dekhuijzen, R., & Heijdra, Y.F. (2011). Exercises commonly used in rehabilitation of patients with chronic obstructive pulmonary disease: Cardiopulmonary responses and effect over time. *Archive of Physical Medicine Rehabilitation, 92*, 111-117. doi:10.1016/j.apmr.2010.08.012

Vitacca, M., Clini, E., Bianchi, L., & Ambrosino, N. (1998). Acute effects of deep diaphragmatic breathing in COPD patients with chronic respiratory insufficiency. *European Respiratory Journal*, *11*, 408-415. doi:10.1183/09031936.9811020408

Voelkel, N. F., & Tuder, R. (2000). COPD: Exacerbation. *Chest, 117*(5), 376S-379S. doi:10.1378/chest.117.5_suppl_2.376S

Wade, L.M. (2002). A comparison of the effects of vocal exercises/singing versus music assisted relaxation on peak expiratory flow rate of children with asthma. *Music Therapy Perspectives*, *20*(1), 31-37. doi: 10.1093/mtp/20.1.31

Wai-Shan Louie, S. (2004). The effects of guided imagery relaxation in people with COPD. *Occupational Therapy International, 11*(3), 145-149. doi: 10.1002/oti.203

Wedzicha, J.A., & Seemungal, T.A.R. (2007). COPD exacerbations: Defining their cause and prevention. *The Lancet, 370*, 786-96. doi:10.1016/S0140-6736(07)61382-8

Weiner, P., Magadle, R., Beckerman, M., Weiner, M., & Berar-Yanay, N. (2003). Comparison of specific expiratory, inspiratory, and combined muscle training programs in COPD. *Chest, 124*(4), 1357-1364. doi:10.1378/chest.124.4.1357

Wilson, J.S., Elborn, J.S., & Fitzsimons, D. (2010). It's not worth stopping now: Why do smokers with chronic obstructive pulmonary disease continue to smoke? A qualitative study. *Journal of Clinical Nursing*, *20*, 819-827. doi: 10.1111/j.1365-2702.2010.03319.x

Wilson, J.S., O'Neill, B., Reilly, J., MacMahon, J., & Bradley, J.M. (2007). Education in pulmonary rehabilitation: The patient's perspective. *Archives Physical Medical Rehabilitation, 88*, 1704-1709. doi:10.1016/j.apmr.2007.07.040

Zhang, M.W.B., Ho, R.C.M., Cheung, M.W.L., Fu, E., & Mak, A. (2011). Prevalence of depressive symptoms in patients with chronic obstructive pulmonary disease: A systematic review, meta-analysis and meta-regression. *General Hospital Psychiatry*, *33*(3), 217-223. doi:10.1016/j.genhosppsych.2011.03.009

# APPENDICES

# APPENDIX A

Flyer for Study

Cigarette Smokers Needed!

Looking for men who smoke daily and live in section.

You are invited to participate in a study focused on breathing.

It will require a 1 1/2 hour commitment.

If you are interested or would like more information,
please see Leanne in the Activity office in the MSC.

944-4900

# APPENDIX B

Consent Form

## INTRODUCTION

The Department of Music Therapy at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

## PURPOSE OF THE STUDY

The purpose of this study is to examine the lung function of people who smoke after engaging in pursed lip breathing, singing, and kazoo playing.

## PROCEDURES

During this research you will be asked to do pursed lip breathing, singing, and kazoo playing for five minutes each.

You will be asked to breathe into a spirometer so your breathing can be measured. The spirometer reading will be taken 7 times. You will also answer questions about your experience doing pursed lip breathing, singing, and kazoo playing.

You will be asked to disclose your age, height, and weight. Your name will not be associated with any paperwork. The only place your name will appear will be on this consent form.

This study will take an hour and a half of your time.

## RISKS

The only risks will be potential anxiety from singing or playing kazoo and potentially shortness of breath or coughing during the spirometer reading. No other risks are anticipated however, if at any time during the process you would like to stop, the session will be ended.

## BENEFITS

This research may benefit other people who smoke and individuals who develop COPD.

PAYMENT TO PARTICIPANTS

You will not be paid for participating in this study.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher will use a study number or a pseudonym rather than your name. Your identifiable information will not be shared unless (a) it is required by law or university policy, or (b) you give written permission.

Permission granted on this date to use and disclose your information remains in effect indefinitely. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future."

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or the Veteran's Home of Yountville and the State of California. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about you, in writing, at any time, by sending your written request to: Leanne Wade, M.A., MT-BC, Member Services Center 60 California Drive, Yountville California 94559.

If you cancel permission to use your information, the researcher will stop collecting additional information about you. However, the researcher may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385, write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

Print Participant's Name Date

_____

Participant's Signature

Researcher Contact Information

Leanne Wade, M.A., MT-BC
Music Education/Music Therapy
60 California Drive
Veteran's Home of Yountville
Yountville, CA 94599
707 944 4900

Cynthia Colwell, Ph.D. MT-BC
Music Education/Music Therapy
1530 Naismith Dr. 448
University of Kansas
Lawrence, KS 66045
785 864 9636

## APPENDIX C

Appointment Form

Thank you for agreeing to participate in the study.

Your appointment:

date:

time:

place: Room 129B (located downstairs in the Member Services Building)

If you wear glasses, please bring them.

If you wear hearing aids, please wear them.

If you need to cancel this appointment, please call 944-4900.

Thank you,

Leanne

Music Therapist
Member Services

## APPENDIX D

Cigarette Dependence Scale-5

1. Please rate your addiction to cigarettes on a scale of 0–100 _____
   I am NOT addicted to cigarettes = 0
   I am extremely addicted to cigarettes = 100

2. On average, how many cigarettes do you smoke per day? _____

3. Usually, how soon after waking up do you smoke your first cigarette?
   Number of minutes. _____

4. For you, quitting smoking for good would be (circle one):

   Impossible
   Very difficult
   Fairly difficult
   Fairly easy
   Very easy

5. After a few hours without smoking, I feel an irresistible urge to smoke.

   Totally disagree
   Somewhat disagree
   Neither agree nor disagree
   Somewhat agree
   Fully agree

Ratings for CDS-5

1. 0 – 20 = 1
   21 – 40 = 2
   41 – 60 = 3
   61 – 80 = 4
   81 – 100 = 5

2. 1 – 5 = 1
   6 – 10 = 2
   11 – 20 = 3
   21 – 29 = 4
   30+ = 5

3. 0 – 5 = 5
   6 – 15 = 4
   16 – 30 = 3
   31 – 60 = 2
   61+ = 1

4. Impossible = 5
   Very Difficult = 4
   Fairly difficult = 3
   Fairly easy = 2
   Very easy = 1

5. Totally disagree = 1
   Somewhat disagree = 2
   Neither agree nor disagree = 3
   Somewhat agree = 4
   Fully agree = 5

Etter, J.F., Le Houezec, J., & Perneger, T.V. (2003). A self-administered questionnaire to measure dependence on cigarettes: The cigarette dependence scale. *Neuropsychopharmacology, 28*, 359-370. doi:10.1038/sj.npp.130003

## APPENDIX E

Initial Eligibility Script

Hi, I'm Leanne. What's your name?

What section do you live in?

Thank you for coming in.

You are here about the study with people who smoke? (If they answer yes…)

In order to check if you can participate we need to do 3 things.

The first thing is to get consent from you to ask you questions and take a lung function reading.

All your information will be kept confidential and will not appear in your medical charts

None of this information will be given to anyone at the home. Please read over the consent form and ask any questions.

I am going to ask you five questions about your smoking habits.

(Ask resident the CSD-5 questions.)

Thank you.

Now the second task is to play a kazoo.

Have you ever played a kazoo? (Hold up a kazoo.)

A kazoo changes the way your voice sounds.

You do not want to blow into it.

You can put it in your mouth and make a sound, like this.

(Demonstrate singing without the kazoo and then with the kazoo.)

Let me hear you sing without the kazoo.

Now, put it on your lips with your mouth slightly open and sing through it.

(Allow 5 attempts before determining that it won't work. If they are successful with making a sound on the kazoo, continue with the spirometer.)

The last thing we are going to do is take a measure of how your lungs are functioning.

This is called a spirometer, have you used one?

Sit up as best you can.

I'm going to check your oxygen level by placing this device on your finger.

You are going to take a deep breath

Place the mouthpiece into your mouth and close your lips around it tightly.

Blow out, as fast and hard as possible, try to keep blowing for 6 seconds.

Watch while I do it (Demonstrate for the resident.)

Ok, now it is your turn.

Place nose clip.

Sitting up, take a deep breath, put the mouthpiece in your mouth and blow, blow, blow, blow. (Stop saying "blow" when they are no longer able to exhale.)

Ok, great! I'm going to let you catch your breath.

Great!

If successfully meets criteria:

(Determine a time and day that will work for the resident.)

Here is your reminder, I will see you date/time in room 129B! Thank you!

(Resident will be handed a piece of paper with the date, time and room number. Resident will be sent a paper reminder notice the day before the appointment.)

If they do not meet criteria:

Thank you for coming in! Unfortunately, I won't be able to use you in this study.

# APPENDIX F

Spirometer Directions

1. Place the cardboard mouthpiece into the end of the meter.
2. Sit with good posture.
3. Place nose clip.
4. Take a deep breath.
5. Place the mouthpiece into your mouth past your teeth and close your lips around it tightly.
6. Breathe through the mouthpiece, when ready blow out, as fast and hard as possible, try to keep blowing for 6 seconds.
7. Complete this process 3 times.

Spirometry testing (lung function test) (2013). Retrieved from http://www.nationaljewish.org/programs/tests/pulmonary-physiology/pulmonary-function/spirometry/

## APPENDIX G

Borg Rating of Perceived Exertion (RPE)

Please circle the number of how you feel after the session. Exertion is usually felt as strain or fatigue in the muscles and as breathlessness.

6 No exertion at all

7

Extremely light

8

9 Very light

10

11 Light

12

13 Somewhat hard

14

15 Hard

16

17 Very hard

18

19 Extremely hard

20 Maximal exertion

Borg, G.A. (1982). Psychophysical bases of perceived exertion. *Medicine and Science in Sports Exercise, 14*, 377-381.

## APPENDIX H

Post-Intervention Questionnaires

Participant # _____ Intervention: Pursed Lip Breathing

1. If pursed lip breathing made your breathing better, would you be willing to do it?

   Yes No

2. How many times per day would you be willing to practice pursed lip breathing for 5-minutes on your own?

   0 1 2 3 4 5

3. How many times per day would you be willing to practice pursed lip breathing for 5-minutes with a music therapist?

   0 1 2 3 4 5

4. Do you think pursed lip breathing improved your breathing?

   Yes No

Participant # _____ Intervention: Singing

1. If singing made your breathing better, would you be willing to do it?

   Yes No

2. How many times per day would you be willing to practice singing for 5-minutes on your own?

   0 1 2 3 4 5

3. How many times per day would you be willing to practice singing for 5-minutes with a music therapist?

   0 1 2 3 4 5

4. Do you think singing improved your breathing?

   Yes No

Participant # _____ Intervention: Kazoo

1. If playing kazoo made your breathing better, would you be willing to do it?

   Yes No

2. How many times per day would you be willing to practice playing kazoo for 5-minutes on your own?

   0 1 2 3 4 5

3. How many times per day would you be willing to practice playing kazoo for 5-minutes with a music therapist?

4. 0 1 2 3 4 5

5. Do you think playing kazoo improved your breathing?

   Yes No

# APPENDIX I

Pursed Lip Breathing Script

1. I am going to have you do pursed lip breathing.
2. Have you ever done it before?
3. I want you to sit comfortably with good posture.
4. You are going to inhale slowly through your nose with your mouth closed; try to take in a normal amount of air.
5. Exhale slowly through your mouth with your lips in the whistling or kissing position. Breathe out for twice as long as you breathe in.
6. Do not take in a large deep breath.
7. Never try to force out the air.
8. I'm going to demonstrate for you.
9. If you were counting in your head, it would sound like inhale one…two, exhale one…two…three…four
10. Does that make sense?
11. Let's do it together.
12. It looks like you have it. I'm going to have you do this for 5-minutes.
13. I'll let you know when the time is over. Start timer.

Breathing retraining: Pursed Lip Breathing. (2009). Retrieved from http://www.nationaljewish.org/healthinfo/conditions/copd-chronic-obstructive-pulmonary-disease/lifestyle-management/breathing-retraining

## APPENDIX J

Singing Script

1. We are going to sing together.
2. Have you ever sung? Church? School?
3. We have four songs today, *You're A Grand Old Flag*, *This Little Light of Mine*, *When the Saints Go Marching In*, and *This Land Is Your Land.*
4. Do you know those songs? (This will only be asked if this is the first of the music interventions.)
5. Here are the lyrics. We are going to start with *You're A Grand Old Flag*.
6. We will continue until we have completed 5-minutes of singing.
7. Sit comfortably with good posture.
8. Strums guitar
9. Here is your starting note…ah.
10. Starts timer.
11. Begin song.
12. (When song ends) Ok, turn to the next song.
13. Here is your starting note…ah.
14. Continue for five minutes, repeat songs as necessary.

## APPENDIX K

Kazoo Script

1. We are going to play kazoo together by singing through the instrument.
2. Go ahead and sing "ah."
3. Place the kazoo in your mouth.
4. (If the participant is making a successful sound, we will continue. If not, we will start again.)
5. We have four songs today, *You're A Grand Old Flag*, *This Little Light of Mine*, *When the Saints Go Marching In*, and *This Land Is Your Land.*
6. Do you know those songs? (This will only be asked if this is the first of the music interventions.)
7. I'm giving you the lyrics so we can keep track of where we are in the music.
8. We will keep playing until we have completed 5-minutes of music.
9. Sit comfortably with good posture.
10. Strums guitar
11. Here is your starting note…kazoo.
12. Starts timer.
13. Begin song.
14. (When song ends) Ok, turn to the next song.
15. Here is your starting note…kazoo hum.
16. Continue for five minutes, repeat songs as necessary.

## APPENDIX L

Song Lyrics

You're A Grand Old Flag

You're a grand old flag,

You're a high flying flag

And forever in peace may you wave.

You're the emblem of

The land I love.

The home of the free and the brave.

Ev'ry heart beats true

'neath the Red, white and blue,

where there's never a boast or brag.

Should auld acquaintance be forgot,

Keep your eye on the grand old flag.  (repeat)

# This Little Light of Mine

This little light of mine, I'm gonna let it shine

This little light of mine, I'm gonna let it shine

This little light of mine, I'm gonna let it shine

Let it shine, let it shine, let it shine

Hide it under a bushel no, I'm gonna let it shine

Hide it under a bushel no, I'm gonna let it shine

Hide it under a bushel no, I'm gonna let it shine

Let it shine, let it shine, let it shine

Don't let anyone blow it out, I'm gonna let it shine

Don't let anyone blow it out, I'm gonna let it shine

Don't let anyone blow it out, I'm gonna let it shine

Let it shine, let it shine, let it shine

This little light of mine, I'm gonna let it shine

This little light of mine, I'm gonna let it shine

This little light of mine, I'm gonna let it shine

Let it shine, let it shine, let it shine

# Oh When the Saints Go Marching In

Oh when the saints go marching in

Oh when the saints go marching in

Oh I want to be in that number

When the saints go marching in

And when the sun refuse to shine

And when the sun refuse to shine

Oh I want to be in that number

When the sun refuse to shine.

Oh when the saints go marching in

Oh when the saints go marching in

Oh I want to be in that number

When the saints go marching in

# This Land Is Your Land

This land is your land, this land is my land

From California to the New York Island

From the Redwood Forest to the Gulf Stream waters

This land what made for you and me.

As I went walking that ribbon of highway

I saw above me that endless skyway

I saw below me that golden valley

This land was made for you and me

This land is your land, this land is my land

From California to the New York Island

From the Redwood Forest to the Gulf Stream waters

This land what made for you and me.

I roamed and rambled and I followed my footsteps

To the sparkling sands of her diamond deserts

While all around me a voice was sounding

This land was made for you and me