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The Effects of Dance Therapy on Voice in Patients with Parkinson's Disease in a Multicultural Population

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THE EFFECTS OF DANCE THERAPY ON VOICE IN PATIENTS WITH PARKINSON'S
DISEASE IN A MULTICULTURAL POPULATION

A Thesis

by

IVON N. RAMIREZ

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DISEASE IN A MULTICULTURAL POPULATION

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May 2018

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ABSTRACT

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Current literature suggests that dance therapy in patients with Parkinson's disease (PD) shows noticeable improvement in motor functions, such as gait and balance improvement. Therefore, it is believed that increases in core support and improvements in posture, as a result of dance therapy, will have effects on the voice in patients with PD.

This thesis pulls from literature supporting treatment approaches in the field of speech-language pathology for voice in patients with PD. The aim of this study was to evaluate the benefits of dance therapy on voice in patients with PD in a multicultural population and mark the importance of exploring individualized, evidence-based practice within this population. Research findings revealed respondents were split in half in their perceptions of whether dance therapy had effects on their voice production.

DEDICATION

Pursuing my education and achieving my goals would not have been possible without the unconditional love, support, and encouragement from my family and friends. Para mis padres, Martin y Rosy, no hay palabras para expresar lo afortunada que soy de tener su apoyo y cariño. E logrado mis metas porque nunca me faltó nada, y eso lo debo a ustedes. To my brothers, Martin Hernan, Alexis, and Fernando, thank you for helping me become the strong-minded woman I am today. To my nieces, Paola Sophia and Ana Camila, and my nephew, Santiago Emilio, thank you for the laughter and heartwarming moments that helped me through stressful times throughout the journey. Lastly, Michele, Freddy, and all family and friends, thank you for your endless support, love, and patience.

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I would like to thank all of my other professors and supervisors that I have had at the University of Texas Rio Grande Valley, who have as well helped me along my academic journey by providing the foundation for my knowledge and skills. I would also like to acknowledge and thank my classmates for their support, motivation, and feedback.

Finally, to my Tío Yune, to the patients from the B.E.S.T. program, and to every individual that has suffered from Parkinson's disease, thank you for inspiring me and providing the loudest voice for my research. I hope that my findings will contribute to advances in voice treatment for individuals with Parkinson's disease.

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CHAPTER I

INTRODUCTION

The aim in writing this thesis is to present the effects of dance therapy on voice in patients with Parkinson's disease in a multicultural population. Parkinson's disease (PD) is a neurodegenerative movement disorder of the central nervous system which especially impairs patients' motor skills, as well as the autonomic nervous functions and state of mind (Harris, 2008). The cardinal features of PD are resting tremor, rigidity, stooped posture, shuffling gait, and bradykinesia, all of which can negatively impact the fluidity and pacing of movement (Jones et al. 2009; Pontone et al. 2009).

In addition to motor (movement-related) symptoms, individuals with PD may also exhibit non-motor (unrelated to movement) symptoms, including apathy, depression, and cognitive impairments. Motor and non-motor symptoms seen in PD may contribute to speech and language impairments. As many as 50 to 90% of individuals with PD will develop speech and voice disorders in the course of their illness, with the most common perceptual features of these disorders related to speech-language pathology being reduced loudness (hypophonia), reduced prosodic pitch inflection (hypoprosodia or monotone speech), hoarse voice, and imprecise articulation (Mahler, Ramig, Fox, 2015).

PD is the second most common age-related neurodegenerative disorder after Alzheimer's disease, affecting an estimated 1 million people in the United States. Studies show the incidence of PD in Hispanics is 16.6 per 100,000 persons, compared to 13.6 per 100,000 in non-Hispanic

Whites, 11.3 per 100,000 in Asians, and 10.2 per 100,000 in Blacks (Van Den Eeden, Tanner, Bernstein, Fross, Leimpeter, Bloch, & Nelson, 2003). The incidence of the disease, or the rate of newly diagnosed cases, generally increases with age, although it can stabilize in people who are older than 80. An estimated 4 percent of people with Parkinson's are diagnosed before the age of 50. As the life expectancy has increased worldwide, it is expected that the burden of chronic diseases, like PD, will continue to grow. It is estimated that the number of people with PD in 2005 was approximately between 4.1 million and 4.6 million and that will more than double by 2030 to between 8.7 million and 9.3 million (Van Den Eeden et al., 2003).

According to the U.S. Census, the population age 65 and older is expected to more than double between 2012 and 2060, from 43.1 million to 92.0 million. Of those age 65 and older in 2060, 56.0 percent are expected to be non-Hispanic white, 21.2 percent Hispanic and 12.5 percent non-Hispanic black. In contrast, while 52.7 percent of those younger than 18 were non-Hispanic white in 2012, that number would drop to 32.9 percent by 2060. Hispanics are projected to make up 38.0 percent of this group in 2060, up from 23.9 percent in 2012 (U.S. Census Bureau Public Information Office, 2016).

The growing number of minority populations, specifically in the geriatric population, shows the increasing need for culturally-sensitive, evidence-based treatment options for patients with PD. Research shows pharmacological, surgical, and behavioral interventions are possible treatment options; however, current treatment for voice impairments in patients with PD is limited. PD rehabilitation is subject to several basic methods, such as motor learning and motor training (Roiz et al. 2010). Current literature suggests there is a limited, but increasing, number of studies on the effects of dance on people with PD (Hackney and Bennett 2014). Dance therapy shows noticeable improvement in motor functions, for example gait and balance improvement

(Hackney, Earhart 2010).

Although there is limited research on the effects of dance therapy on PD, there is a significantly lesser amount of research on the effects of dance therapy on *voice* in patients with PD, especially in the Hispanic population. Thus, there is a need to test alternative interventions that can address voice impairments among other motor, cognitive and emotional symptoms. The American Speech-Language-Hearing Association (ASHA) mandates that all its members use independent and evidence-based clinical judgment, keeping paramount the best interests of those being served. Additionally, ASHA states that professional competence requires that audiologists and speech-language pathologists (SLPs) practice in a manner that considers each client's/patient's/family's cultural and linguistic characteristics and unique values so that the most effective assessment and intervention services can be provided. Therefore, it is the responsibility of speech-language pathologists to explore various treatment options and promote individualized, evidence-based practice for each patient.

The focus of this thesis is to develop an in-depth understanding of PD and its effects on voice by reviewing the pathology of PD and its progression and the incidence and prevalence rates of PD in the U.S. population and in Hispanic individuals in the U.S. The role of speech-language pathologists and interventions currently available for voice impairments will also be investigated. Additionally, this thesis will explore the commonalities found within the literature to determine the effects of dance therapy on voice in patients with PD in a multicultural population.

CHAPTER II

REVIEW OF LITERATURE

Search Method

A systematic search of the literature was undertaken up until the end of January 2018 across seven databases (i.e. ASHA Journal, ComDisDome/ProQuest, PsychInfo/EBSCOHost, PubMed, and Google Scholar). The terms searched to identify relevant results were Parkinson's disease, dance therapy, voice, and Hispanic population. Inclusion criteria initially encompassed only studies that evaluated the effects of dance therapy as voice treatment in individuals with PD in the Hispanic population. Scholarly peer-reviewed journals that spanned over the last ten years were reviewed; however, limited information was found. A continued effort was made to identify active research including the effects on voice in patients with PD in a multicultural population by expanding the studies to include the following search terms: Parkinson's disease, dance therapy, voice impairment, speech therapy, and multicultural population. Studies that evaluated the effects of dance therapy on individuals with PD were also included to determine a correlation between voice treatment and the effects of dance therapy on motor and non-motor symptoms of PD.

The suitability of articles was determined in a staged process. First, titles and abstracts were read and articles that were obviously unrelated to this review were excluded. Then, the remaining articles were read in full and those not meeting all inclusion criteria were excluded. Reference lists from suitable articles were also searched. To obtain the desired information, a

scaffolded search through three tiers was completed. Level 1 included the initial search of Parkinson's disease (53,895-PubMed; 157-ComDisDome; 34,654-EBSCOHost; 222,000-Google Scholar; 645-ASHA Journal). Level 2 included a search under the terms voice impairment and speech therapy (931-PubMed; 110-ComDisDome; 6-EBSCOHost; 17,900-Google Scholar; 827-ASHA Journal). Level 3 included a search under the terms dance therapy (630-PubMed; 8-ComDisDome; 268-EBSCOHost; 55,700-Google Scholar; 78-ASHA Journal). This search identified a total of 387,809 scholarly articles that completed investigations of the effects of dance therapy on voice in patients with PD in multicultural populations. Scholarly articles excluded from this literature review include studies conducted on only one population group, studies in which participants were not diagnosed with Parkinson's disease, although presented with Parkinsonian symptoms, and studies exploring the effects of therapy on parameters other than voice and motor functions, such as core support, and postural stability.

This section will review the pathology of Parkinson's disease and its progression, investigate interventions currently available for voice impairments, review incidence and prevalence rates of PD in the U.S. population and in Hispanic individuals in the U.S., and explore the commonalities found within the literature to determine the effects of dance therapy on voice in patients with PD.

Parkinson's Disease

Parkinson's disease (PD) is a progressive neurological disorder of the central nervous system which especially impairs individuals' motor skills, as well as autonomic nervous functions and state of mind. PD is characterized by resting tremor, muscle rigidity, postural instability, gait abnormalities, bradykinesia, and akinesia. It impacts physical, physiological, emotional, social and financial function and consequently has a profound effect on quality of life (Jankovic, 2008).

Neuropathology

To better illustrate the complexity of a neurological disease, such as Parkinson's disease (PD), a review of the neuropathology of such disease should be completed. Research shows that a marked decrease in the level of dopamine, a neurotransmitter that plays an important role in the inhibition of nerve impulses in the brain, has been noted in patients with Parkinson disease. This decrease, which occurs primarily in a region of the brain called the substantia nigra, has been attributed to the loss of so-called dopaminergic neurons that normally synthesize and use dopamine to communicate with other neurons in parts of the brain that regulate motor function (Houlden & Singleton, 2012). The cause of decreased dopamine levels is unclear.

A protein, known as alpha synuclein, appears to be involved in neuronal degeneration. Alpha synuclein is produced by dopaminergic neurons and is broken down by other proteins, such as parkin and neurosin. Defects in any of the proteins that break down alpha synuclein may lead to its accumulation, resulting in the formation of deposits called Lewy bodies in the substantia nigra (Houlden & Singleton, 2012). However, other mechanisms affecting the accumulation of alpha synuclein have been identified, and it is not clear whether Lewy bodies are a cause of or occur as a result of the disease. Other findings in people affected by Parkinson disease include mitochondrial dysfunction, leading to increased production of free radicals that cause significant damage to brain cells, and heightened sensitivity of the immune system and neurons to molecules called cytokines, which stimulate inflammation (Houlden & Singleton, 2012).

The neuropathology that encompasses the nature of PD is further detailed in its complexity. It is suggested that the vast majority of PD cases are sporadic and are probably caused by interaction of environmental and genetic factors.

Petrucci and Dickson (2008) explain the following:

Approximately 5-10 % of patients have a monogenic, autosomal dominant or recessive form of PD. The first autosomal dominant form of PD identified is that caused by mutations of alpha synuclein, a synaptic protein encoded by SNCA on 4q22. This discovery led to identification of alpha synuclein in Lewy bodies and Lewy neuritis. (pp.35-36)

As previously mentioned, the gene most commonly associated with autosomal recessive PD is Parkin. The clinical and pathological phenotype of PD in GD is similar to idiopathic PD except that it has an earlier onset and causes more cognitive impairment. The mechanism by which GD causes PD is unknown, but it is thought to be a combination of lysosomal impairment, mitochondrial dysfunction, oxidative and endoplasmic reticulum stress induced by GD. These changes impair alpha synuclein degradation, leading to its accumulation (Petrucci & Dickson, 2008).

The core pathology of PD affects the dopamine-producing neurons of the substantia nigra (SN). The mid-section of the SN (zonal compacta) is involved earliest and most severely. In advanced PD, loss of pigmented neurons results in gross depigmentation of the SN. Neuromelanin released from dying neurons is picked up by macrophages and astrocytes, and a small amount is found free in the neuropil. Dopamine is produced by SN neurons from DOPA (also a precursor of melanin) and transported along the axons of these neurons to the striatum. The triad of rigidity, bradykinesia, and tremor at rest correlates with degeneration of the dopaminergic nigrostriatal pathway and dopamine depletion in the striatum. Alpha synuclein deposits and LBs are also present in the cerebral cortex, limbic system, and in many extra-nigral neuronal groups, including the reticular activating system, locus ceruleus, dorsal motor nucleus

of the vagus, the nucleus basalis of Meynert, olfactory nerves, sympathetic ganglia, and myenteric plexus, leading to impairment of noradrenergic, serotonergic, and cholinergic neurotransmission (Petrucci & Dickson, 2008).

This widespread pathology has only been fully appreciated in recent years, when antibodies to alpha synuclein made it easier to detect LBs and synuclein deposits outside the SN. Thus, PD should be viewed as a systemic disorder that affects the entire CNS and PNS, not just the dopaminergic system. This widespread involvement explains the diverse motor and non-motor manifestations of PD (Stanley, 2008, pp.3).

Recently, there has been a proliferation of published research on the neural bases of Parkinson disease, which has led to an increased understanding of the underlying neurophysiology associated with changes in voice and speech. It is well established that the symptoms of Parkinson disease are associated with alterations in basal ganglia circuitry due to a decrease in dopamine in the substantia nigra pars compacta. Understanding of the potential underlying neurophysiology of dopamine loss may only be a partial explanation for voice and speech disorders in PD. Recent research suggests that non-dopaminergic neurons are also involved in the development of Parkinson disease and that these changes begin before the onset of Parkinson disease symptoms (Mahler, Ramig, & Fox, 2015). Familiarity with neurological structures affected by neurological diseases, such as PD, not only provides a better understanding of the changes seen in patients with PD, but serves as an unfortunate reminder that this is a progressive, irreversible disease. Thus, treatment should focus on maintaining strength, controlling symptoms, and improving quality of life.

Cardinal Features

To review, Parkinson's disease (PD) is a progressive neurological disorder of the central nervous system which especially impairs individuals' motor skills, as well as autonomic nervous functions and state of mind. PD is called a movement disorder because of the tremors, slowing and stiffening movements it can cause, and these are the most obvious symptoms of the disease. But Parkinson's affects many systems in the body. Its symptoms are different from person to person and usually develop slowly over time.

Although PD is characterized by bradykinesia, tremors, and rigidity, additional motor symptoms may be present. Motor symptoms seen in individuals with PD include: dystonia, sialorrhea, dyskinesia, akinesia, festination, freezing, hypomimia, micrographia, shuffling gait, postural instability, and hypophonia. Motor and non-motor symptoms impact physical, physiological, emotional, social and financial function and consequently has a profound effect on quality of life (Sharp & Hewitt, 2014).

As previously mentioned, dopamine is a chemical messenger (neurotransmitter) that is primarily responsible for controlling movement, emotional responses and the ability to feel pleasure and pain. In individuals with PD, the cells that make dopamine are impaired. As PD progresses, more dopamine-producing brain cells die. The brain eventually reaches a point where it stops producing dopamine in any significant amount, causing increasing problems with movement. Although this neuropathology is believed to be the cause for PD, individuals with PD will demonstrate differing severities of symptoms.

PD can be diagnosed with considerable accuracy, particularly by neurologists specializing in diagnosis and management of movement disorders when robust clinical criteria are used, such as those of the Queen Square Parkinson Disease Brain Bank. The Queen Square

Parkinson Disease Brain Bank has inclusion criteria (bradykinesia and at least one of rigidity, tremor, or postural instability) and exclusion criteria (absence of strokes, head injury, encephalitis, neuroleptic treatment, supranuclear gaze palsy, cerebellar signs, early severe autonomic dysfunction, early dementia pyramidal tract, exposure to toxins signs), as well as presence of supportive features (chronic progressive disease course, unilateral onset and asymmetry of signs during disease course, excellent and prolonged response to levodopa, late levodopa-induced dyskinesia) (Hughes et al. 2002).

There are several different rating scales that may be used to assess the stage of Parkinson's disease (PD) in an individual. The two most commonly used are the Hoehn and Yahr scale and the Unified Parkinson's Disease Rating Scale. The Hoehn and Yahr scale was utilized for the purpose of this study. The Hoehn and Yahr scale was named for its authors, was published in 1967 and was the first rating scale to describe the progression of PD. The Hoehn and Yahr scale describes five stages to PD progression:

1. Stage One of PD: In stage one, the earliest stage, the symptoms of PD are mild and only seen on one side of the body (unilateral involvement), and there is usually minimal or no functional impairment. The symptoms of PD at stage one may be so mild that the person doesn't seek medical attention or the physician is unable to make a diagnosis. Symptoms at stage one may include tremor, rigidity, or slowness of movement in the arm or leg on one side of the body, or one side of the face may be affected, impacting the expression.
2. Stage Two of PD: Stage two is still considered early disease in PD, and it is characterized by symptoms on both sides of the body (bilateral involvement) or at the midline without impairment to balance. Stage two may develop months or years after

stage one. Symptoms of PD in stage two may include the loss of facial expression on both sides of the face and decreased blinking. Speech abnormalities may be present, such as soft voice, monotone voice, fading volume after starting to speak loudly, or slurring speech. There also may be stiffness or rigidity of the muscles in the trunk that may result in neck or back pain, stooped posture, and general slowness in all activities of daily living. Diagnosis may be easy at this stage if the patient has a tremor, however, if stage one was missed and the only symptoms of stage two are slowness or lack of spontaneous movement, PD could be misinterpreted as only advancing age.

3. Stage Three of PD: Stage three is considered mid-stage and is characterized by loss of balance and slowness of movement. Balance is compromised by the inability to make the rapid, automatic, and involuntary adjustments necessary to prevent falling, and falls are common at this stage. All other symptoms of PD are also present at this stage, and generally diagnosis is not in doubt at stage three. An important clarifying factor of stage three is that the patient is still fully independent in their daily living activities, such as dressing, hygiene, and eating.

4. Stage Four of PD: In stage four, PD has progressed to a severely disabling disease. Patients with stage four PD may be able to walk and stand unassisted, but they are noticeably incapacitated. Many use a walker to help them. At this stage, the patient is unable to live an independent life and needs assistance with some ADL.

5. Stage Five of PD: Stage five is the most advanced and is characterized by confinement to a bed or wheelchair. People with stage five PD may be unable to rise from a chair or get out of bed without help, they may have a tendency to fall when standing or turning, and they may freeze or stumble when walking. Around-the-clock assistance is required at

this stage to reduce the risk of falling and help the patient with all daily activities. At stage five, the patient may also experience hallucinations or delusions.

The Modified Hoehn and Yahr scale includes the same characteristics, but has divided the stages into half-point increments (i.e. Stage 1, Stage 1.5, Stage 2).

While the symptoms worsen over time, it is worth noting that some patients with PD never reach stage five. People with PD may also never experience some of the above symptoms. It is important to note that not every individual with PD will present with the same symptoms, at the same level of severity. Many factors may be attributed to this difference, such as the diversity of the disease or other health complications seen in individuals with PD. Although not every individual with PD will present with the same severity of motor and non-motor symptoms, such as the cardinal features described in the Hoehn and Yahr scale, as many as 50 to 90% of individuals with Parkinson's disease (PD) will develop speech and voice disorders in the course of their illness (Mahler, Ramig, Fox, 2015).

Parameters of Speech

In the field of speech-language pathology, there are five subsystems or speech parameters within the scope of practice. These parameters of speech include respiration, phonation, resonance, articulation, and prosody. Each parameter works in a way that needs the others to ultimately produce verbal speech. In the normal production of voice, the airstream is generated by the lungs. As the air passes through the larynx, the vocal folds are set into vibratory motion, which results in the production of sound (phonation). The sound continues to travel through the upper vocal tract and is modified by the resonating characteristics of the pharynx and oral and nasal cavities. Therefore, healthy voice production requires normal and synchronized participation of the respiratory system (lungs, diaphragm, ribs, and abdominal and chest

muscles), the vibratory system (larynx, vocal folds, and glottis), and the resonating system (pharyngeal, oral, and nasal cavities) (Shipley & McAfee, 2016).

Voice. A voice disorder is a disturbance of pitch, loudness, or quality in relation to an individual's age, gender, and cultural background (Boone, McFarlane, Von Berg, & Zraik, 2010). Pitch is the perceptual correlate of frequency. The relative length and thickness of the vocal folds determine voice pitch. The voice becomes higher in pitch when the vocal folds are elongated with a concurrent decrease in mass and increase in elasticity of the vocal folds. Voice quality is difficult to define but can be described as the aspects of a voice that differentiate it from another voice at identical pitch and loudness levels (Shipley & McAfee, 2016). It is regulated, at least in part, by the manner and force with which the vocal folds approximate one another (Roth, 2015). Although vocal pitch is largely controlled by the laryngeal mechanism, respiration also plays a role. Loudness and pitch are controlled by different physiologic mechanisms. Loudness is the perceptual counterpart to amplitude and is determined primarily by the amount of and speed of subglottal air pressure. A voice becomes louder when there is an increase in the volume and velocity of the airstream as it passes through the glottis (Shipley & McAfee, 2016). Thus, respiration is said to be the power mechanism for speech, as it provides energy for the sound produced.

The respiratory system is composed of an anatomical framework including, the spinal column, sternum, ribs, pectoral girdle, and pelvic girdle. Attached to this framework are intricate set of muscles of inspiration and expiration which constitute the two phases of respiration. Among these set of muscles is a major muscle responsible for breathing, the diaphragm. This thin, dome-shaped muscle separates the abdominal cavity from the thoracic cavity. The diaphragm is attached to the base of the sternum, the lower parts of the rib cage, and the spine.

As the diaphragm contracts, it increases the length and diameter of the chest cavity and thus expands the lungs. The intercostal muscles help move the rib cage and thus assist in vegetative and breathing and breath for vocal activity. Although the muscles inspiration and expiration are used for vegetative and voice production breathing, the muscle activity differs. When not speaking, inhalation and exhalation phases take the same amount of time; however, for speech, the exhalation phase is longer (Shiple & McAfee, 2016). Changes in the structure and function of the anatomical framework for the respiratory system has adverse effects on voice production.

Measuring the severity of a voice disorder is difficult. Methods have ranged from subjective measures of voice disorder severity including perceptual judgments (e.g., grading of voice quality as mild, moderate, or severe) to objective measures of voice characteristics (e.g., videostroboscopic findings and physiological measure of voice compared to normative data). Although these methods can yield valuable data, they do not provide insight into why patients with similar voice disorders experience differing levels of handicap and disability (Roth, 2015).

The Voice Handicap Index, created by Jacobson, Johnson, Grywalski, Silbergleit, Jocenson, and Benninger, is a widely used instrument in measuring the severity of a voice disorder. The Voice Handicap Index (VHI) was designed to quantify the psychosocial consequences of voice disorders. It consists of three subscales: the functional prompts evaluate the impact of a person's voice on daily activities, the emotional prompts evaluate the client's affective response to his or her voice, and the physical prompts evaluate the client's own perceptions of vocal quality. Altogether, this 30-item questionnaire measures the influence of voice problems on a patient's quality of life (Shiple & McAfee, 2015).

Voice disorders. Disorders of laryngeal, respiratory and articulatory function have been documented across a number of perceptual, acoustic and physiological studies in people with

PD. The neural mechanisms underlying these voice and speech disorders are unclear. Traditionally, they have been attributed to motor signs of the disease such as rigidity, bradykinesia, hypokinesia and tremor. Of particular importance to speech and voice disorders in people with PD are the proposed pathophysiological mechanisms underlying bradykinesia or hypokinesia: inadequate muscle activation. Voice problems are typically the first to occur, with other problems, such as prosody, articulation and fluency, gradually appearing as the speech disorder progresses (Ramig et al., 2008).

As previously stated, normal voice production depends on power and airflow supplied by the respiratory system; laryngeal muscle strength, balance, coordination, and stamina; and coordination among these and the supraglottic resonatory structures (pharynx, oral cavity, nasal cavity) (American Speech-Language-Hearing Association, 2018). A disturbance in one of the three subsystems of voice production (i.e., respiratory, laryngeal, and subglottal vocal tract) or in the physiological balance among the systems may lead to a voice disturbance. Disruptions can be due to organic, functional, and/or psychogenic causes.

Traditionally, voice disorders have been classified as either organic or functional. *Organic* voice disorders result from pathology or disease, such as PD, that affects the anatomy or physiology of the larynx and other regions of the vocal tract. *Functional* voice disorders are dysphonia related to vocal abuse/misuse or psychogenic factors in the absence of an identifiable physical etiology (Boone, McFarlane, Von Berg, & Zraick, 2013). For the purpose of this paper, we will view the voice disorder associated with PD as an organic voice disorder to better understand the changes that contribute to voice in individuals with PD.

Many organic factors alter the mass of vocal folds alter the mass of vocal folds and result in lowered pitch, decreased loudness, and a breathy, hoarse voice quality. Physiologic

abnormalities associated with voice and speech changes in people with Parkinson disease include reduced vocal fold adduction and asymmetrical patterns of vocal fold vibration, reduced neural drive to laryngeal muscles, poor reciprocal suppression of laryngeal and respiratory muscles, and a reduction in respiratory muscle activation patterns all of which contribute to the perceptual feature of significantly decreased loudness. Additionally, respiratory studies in people with PD have documented reduction or abnormalities in vital capacity, amount of air expended during maximum phonation tasks, intraoral air pressure during consonant/vowel productions, chest wall movements and respiratory muscle activation patterns during speech breathing (Ramig et al., 2008).

Mahler et al., (2015) suggest that motor symptoms of rigidity, weakness, bradykinesia and hypokinesia result from dopamine deficiency, therefore, may also contribute to the voice and speech abnormalities associated with Parkinson disease. Sensory deficits, deficits in internal monitoring of amplitude, and maintenance of amplitude of movements across the speech production mechanism may also be significant factors that contribute to decreased loudness, imprecise articulation and monotone. In addition, some individuals with PD are observed to have dysarthria, a speech disorder caused by weakness, which results in a slurred-like quality, mumbled speech, monotone speech, and difficulty participating in fast-paced conversations (ASHA, 2017).

The complexity of the different types, causes, and symptoms of voice disorders is astounding. Voice disorders affect individuals of all ages, gender, races, and occupations, with some of these factors displaying higher rates of incidence and prevalence. The next section illustrates the demographics of voice disorders reported in the U.S. population, individuals with PD, and in Hispanic individuals with PD.

Incidence and Prevalence

PD is the second most common degenerative neurological disorder after Alzheimer's disease. According to the Mayo Clinic, the prevalence of the disease ranges from 41 people per 100,000 in the fourth decade of life to more than 1,900 people per 100,000 among those 80 and older. The incidence of the disease, or the rate of newly diagnosed cases, generally increases with age, although it can stabilize in people who are older than 80 (Van Houtte, Van Lierde, D'Haeseleer, & Claeys, 2009). An estimated 4% of people with PD are diagnosed before the age of 50. It is estimated that PD affects 1% of the population over the age of 60. Overall, as many as one million Americans are living with PD. Approximately 60,000 Americans are diagnosed with PD each year (Cohen, Kim, Roy, Asche, & Courey, 2012).

Several studies have found that PD is more common in Whites than in Blacks or Asians. It is estimated that the prevalence of PD is 50% lower in Blacks and Asians than in Whites. However, the highest incidence of PD is found in Hispanics, followed by non-Hispanic Whites, Asians, and Blacks. According to one analysis, the incidence of PD in Hispanics is 16.6 per 100,000 persons, compared to 13.6 per 100,000 in non-Hispanic Whites, 11.3 per 100,000 in Asians, and 10.2 per 100,000 in Blacks (Van Den Eeden et al., 2003).

As the life expectancy has increased worldwide, it is expected that the burden of chronic diseases, like PD, will continue to grow. As previously mentioned, PD is largely diagnosed in people over the age of 60. It is estimated that the number of people with PD in 2005 was approximately between 4.1 million and 4.6 million and that will more than double by 2030 to between 8.7 million and 9.3 million (Van Den Eeden et al., 2003). A correlation between Parkinson's disease projections and demographic projections from the U.S. Census can be observed.

According to the U.S. Census, the population age 65 and older is expected to more than double between 2012 and 2060, from 43.1 million to 92.0 million. Of those age 65 and older in 2060, 56.0 percent are expected to be non-Hispanic white, 21.2 percent Hispanic and 12.5 percent non-Hispanic black. In contrast, while 52.7 percent of those younger than 18 were non-Hispanic white in 2012, that number would drop to 32.9 percent by 2060. Hispanics are projected to make up 38.0 percent of this group in 2060, up from 23.9 percent in 2012 (U.S. Census Bureau Public Information Office, 2016).

PD in the Hispanic Population

The cause of PD is still unknown; however, in searching for incidence and prevalence rates between racial groups, a similarity of factors attributing to the high incidence and prevalence rates of PD in the Hispanic population were observed. One factor that may place Hispanics at increased risk of developing Parkinson's is that they are the largest, the fastest growing demographic group of older minorities in the United States. In addition, research suggests many Latinos have been exposed many to environmental pollutants and pesticides through agricultural work.

According to the Willis et al. study from 2010, “environmental factors are likely more common contributors and may include prolonged exposures to herbicides and insecticides used in farming or to metals such as copper, manganese and lead”. Although scientists are still trying to understand potential genetic factors in causing Parkinson's, recent studies in Texas found different pesticides in the homes of pregnant Latinas living along the Texas-Mexico border, especially where there is incidence of developmental problems beginning early in life (Willis, Evanoff, Lian, Criswell, & Racette, 2010). Although the level of support that these factors contribute to the high rates of PD in the Hispanic population is unknown, factors such as, work

environment, among other social factors, as well influence the treatment Hispanic individuals with PD obtain.

It is observed that incidence and prevalence rates of PD in the Hispanic population are greater as compared to other racial groups; however, studies show a resistance or hesitancy for Hispanic individuals to seek treatment. This pattern could be attributed to many factors. Numerous studies underscore the mounting problems faced by the Hispanic population in acquiring medical care. Latinos' greater economic disadvantage often results in their having delayed access to information, lack of education, limited access to health care and cultural factors that make them strongly deny or identify the symptoms as part of their aging process (Willis, Evanoff, Lian, Criswell, & Racette, 2010).

In a study conducted by Flores, Abreu & Olivar (1993), participants were asked to name the single greatest barrier to health care, citing language problems (26%), long waiting time at the physician's office (15%), no medical insurance (13%), and difficulty paying medical bills (7%). Health insurance coverage remains a key to gaining access to medical care. Lack of insurance or inadequate coverage significantly influences Latino health and the ability to obtain need services (Valdez et al., 1993).

Additionally, as Francisco Gonzalez-Scarano, MD, dean of the School of Medicine and vice president for medical affairs at the University of Texas Health Science Center at San Antonio stated, "Several disease experts have commented that there could be more cases of Parkinson's among Hispanics compared to other population groups and one of the key factors was less education". Hispanics commonly do not recognize Parkinson's disease, but rather relate its tremors to the effects of aging, leading to individuals ignoring the symptoms for a prolonged period of time before seeking specialized help (Gonzalez-Scarano, 2016).

This marks the importance of promoting a greater understanding of culturally-based perspectives regarding health and diseases. The working definitions of cultural competence generally held that minorities have difficulty getting appropriate, timely, high-quality care because of language barriers and that they may have different perspectives on health, medical care, and expectations about diagnosis and treatment. Achieving cultural competence in health care would “help remove these barriers, supplanting the current one-size-fits-all approach with a system more responsive to the needs of an increasingly diverse population” (Betancourt, Green, & Carrillo, 2002, pp. 3), as well as promoting individualized treatment plans.

Current Treatment

The role of the speech-language pathologist is primarily to describe and characterize the features of the voice, determine if the features differ from the norm, and, if a disorder is present, explore intervention approaches that will improve the client’s voice. The speech-language pathologist will also make recommendations and referrals as appropriate. Treatment options in PD are manifold. The pharmacological (medications, L-DOPA) and surgical treatments (deep brain stimulation) target mainly motor symptoms, but are in the late stage of the disease-not sufficient to recover motor symptoms completely. The aim of current treatment of Parkinson’s disease is to ameliorate the symptoms while seeking to lessen the potential development of late levodopa complications. This section details the research supporting current treatment for Parkinson’s disease (ASHA, 2017).

Pharmacological Treatment

The first intervention method includes medication to manage symptoms of PD through increasing or substitution of dopamine concentrations. The following medications are commonly prescribed to patients with PD, although each medication has differing weights of research

support. First, in Carbidopa-Levodopa, Levodopa crosses the blood-brain barrier (a physiological partition blocking the entry of large molecules into the central nervous system) via special transport proteins and is converted to dopamine in the brain, primarily in the region containing the substantia nigra. Although initially beneficial in causing a significant remission of symptoms, levodopa frequently is effective for only 5 to 10 years, and serious side effects—including uncontrolled movements, hallucinations, persistent nausea and vomiting, and changes in behavior and mood—often accompany treatment (Heiberger, 2011).

Co-treatment with a drug called carbidopa, which inhibits an enzyme that breaks down levodopa prior to crossing the blood-brain barrier, allows higher concentrations of levodopa to reach the brain. Thus, levodopa-carbidopa combination therapy enables lower doses of levodopa to be administered, thereby reducing side effects. This combination therapy has allowed many patients to live reasonably normal lives. A drug known as entacapone, which slows the metabolism of levodopa, may be given with levodopa and carbidopa (Sanabria, 2001).

For patients who present with more advanced PD and still respond to Carbidopa-Levodopa, Carbidopa-Levodopa infusion may be an option. This U.S. Food and Drug Administration-approved drug, called Duopa, is administered through a small feeding tube that delivers the medication in a gel form directly to the small intestine. Placement of the tube requires a small surgical procedure and risks associated with having the tube include the tube falling out or infections at the infusion site (Sanabria, 2001).

Unlike levodopa, dopamine antagonists don't change into dopamine; instead, they mimic dopamine effects into your brain. Although they are not shown to be as effective as levodopa in treating symptoms, they are observed to last longer. Dopamine agonists include pramipexole (Mirapex), ropinirole (Requip) and rotigotine (given as a patch, Neupro). A short-acting

injectable dopamine agonist, apomorphine (Apokyn), is used for quick relief (Rigrotsky & Morrison, 1970).

Other drugs used to relieve the symptoms of Parkinson disease include agents that stimulate dopamine production in the brain, such as pergolide and bromocriptine, and agents that slow the degradation of dopamine, such as selegiline, a MAO-B inhibitor (brain enzyme monoamine oxidase) which metabolized brain dopamine. In addition, the antiviral agent amantadine can reduce certain symptoms of the disease (Heiberger, 2011).

Although there are a wide range of medications to manage symptoms in individuals with PD, this option is not suited for every individual. Pharmacological methods of treatment in isolation do not appear to significantly improve voice and speech function in PD across research studies (Schulz & Grant, 2000). As previously stated, not all symptoms of PD are seen in every patient. The individual's intervention plan will vary depending on presenting symptoms, concomitant health factors, severity of PD, among other factors.

Surgical Intervention

In some cases where pharmacological treatment is not beneficial to the individual with PD, surgery may be necessary to alleviate advanced symptoms. A well-known surgical procedure, known as deep brain stimulation (DBS), has been successful in decreasing involuntary movements, improving debilitating problems with gait and slowness of movement, and reducing doses of medications. In DBS, an electrode is implanted in the brain and is attached via a lead wire to a neurostimulator, inserted under the skin, usually near the collarbone. The neurostimulator sends electrical signals to the electrode. These signals work by disrupting the physiological impulses that cause disordered movement. DBS is most often offered to individuals with advanced PD who have unstable medication (levodopa) responses. DBS can

stabilize medication fluctuations, reduce or halt involuntary movements, reduce tremor, reduce rigidity, and improve slowing of movement (Mahler, Ramig, Fox, 2015).

Although DBS may provide sustained benefit for PD symptoms, it does not keep PD from progressing. In addition, surgery involves risks, including infections, stroke, or brain hemorrhage. Some individuals also experience problems with the DBS system or have complications due to the stimulation (Schulz & Grant, 2000). Schulz & Grant (2000), recommend that studies should investigate the effects of combined treatment approaches. Perhaps the combination of pharmacological, surgical and speech treatment will prove superior to treatments combining pharmacological and surgical, or pharmacological and speech therapy, in improving the communication abilities of persons with PD.

Lee Silverman Voice Treatment

One of the most widely used and supported interventions for voice in patients with PD is the LSVT LOUD program. LSVT LOUD is as an evidence-based intervention to improve vocal loudness and voice articulation through recalibrating sensorimotor perception of vocal loudness. It is delivered in an intensive manner, with 16-hour long individual sessions delivered over four weeks by a certified LSVT-LOUD therapist.

Ramig, Fox, & Sapir (2004) explained that the five concepts of the LSVT are designed to address the following problems: (1) focus on voice (increase the amplitude of phonatory output); (2) improve sensory perception of effort, that is, “calibration”; (3) administer treatment in a high effort style (i.e., patient required to put forth high effort); (4) treat intensively (four times a week for 16 sessions in 1 month); and (5) quantify treatment-related changes. Administration of treatment four times a week for 1 month is consistent with principles of motor learning, skill acquisition, and muscle training. In addition, the LSVT is administered in a manner to maximize

patient compliance by assigning treatment activities that make an immediate impact on daily functional communication.

LSVT-LOUD targets the cardinal perceptual feature of reduced vocal loudness in people with Parkinson disease, which limits audibility and thus functional communication. Multiple physiologic mechanisms may contribute to reduced vocal loudness including reduced amplitude of movement (hypokinesia), slowness of movement (bradykinesia) and reduced ability to maintain movement amplitude. A breathy or harsh/hoarse voice quality and reduced pitch range may be present due to reduced amplitude of vocal fold movement and incomplete adduction of the vocal folds during phonation. Thus, increasing vocal loudness in treatment to levels more closely approximating normal loudness while simultaneously addressing sensory deficits, targets the proposed physiologic mechanisms underlying bradykinesia and hypokinesia: inadequate muscle activation (Mahler, Ramig, Fox, 2015).

Numerous studies have shown the efficacy of LSVT-LOUD on voice in patients with PD; however, studies show LSVT-LOUD is not effective on all the parameters that contribute to voice. In a study by Ramig (2001), the initial randomized control trial (RCT) compared two treatments designed to improve loudness: one treatment focused on voice and the other treatment focused on increasing respiratory support for speech. Those treatments were matched for intensity of treatment within the treatment session (i.e. number of task repetitions, driving of motor effort, reinforcement from speech clinicians) and in treatment dosage including homework and carryover assignments. Evaluations were conducted immediately before treatment, immediately following treatment and at 6, 12, and 24 months after the completion of treatment. The primary outcome variable in this study was vocSPL. The data showed that intensive voice treatment (LSVT LOUD) was more effective in improving vocSPL than the respiratory

treatment. Thus, there is a need for an intervention that also incorporates an effective treatment designed to improve respiratory changes due to PD (Dumer, 2014).

Although LSVT-LOUD is the most widely supported intensive voice interventions, implementation of this approach may be limited by a number of reasons, including limited availability of certified therapists, participants' ability to commit to the intensive program, and cost of the program. Furthermore, it can be said that LSVT-LOUD is not suitable for all voice patients, as cultural norms and accessibility of services differs for each patient.

ASHA (2017) states, "Clinical approaches—such as interview style, assessment tools, and therapeutic techniques—that are appropriate for one individual may not be appropriate for another". Therefore, it is important to recognize that the unique influence of an individual's cultural and linguistic background may change over time and according to circumstance (e.g., interactions in the workplace, with authority figures, within a social context), necessitating adjustments in clinical approaches. In order to implement an individualized, evidence-based therapeutic technique with our patients, more research support and testing of new therapeutic techniques, or interventions, is necessary.

Dance Therapy

Studies investigating the benefits of dance therapy on motor function in patients with Parkinson's disease were reviewed to determine effects on structures and function related to respiratory support, such as core support, balance, postural stability, and breathing regulation. It is hypothesized that improvements in these motor functions in patients with PD will subsequently have effects on the voice production of patients with PD, as 1) the respiratory system comprises an important role in voice production and 2) research shows that changes in respiration, due to neurological changes and progressing of motor symptoms, are observed in patients with PD. As previously noted, the respiratory system is composed of a set of intrinsic

and extrinsic muscles located on the trunk of the body and improvements in movement, such as postural stability, will increase the amount of lung volumes and capacities, the amount of air inhaled and exhaled, leading to an increased likelihood of a stronger, louder voice.

Emerging evidence suggests that basal ganglia structures are involved in the control of dance movements. It has been noted that there was increased activity in the basal ganglia and specifically the putamen via positron emission tomography, when certain dance movements were performed to a rhythmical beat (British Council for Chinese Martial Arts, 2013). Physical activity has also been found to affect the regulation of neurotransmitters by enhancing the concentration of serotonin, resulting in PD patients generally “feeling better” (Heiberger et al., 2011).

In addition to suggested changes to neurotransmitters and other neurological structures, prior studies have identified many benefits of dance therapy for patients with Parkinson’s disease in the field of physical therapy, including improvements in balance and rhythmic motor coordination, gait, mobility, and range of motion. Dance also offers auditory, visual and sensory stimulation, musical experience, social interaction, memory, motor learning, and emotional interaction.

In the systematic review conducted by Sharp & Hewitt (2014), results showed an improvement in balance at three months which was sustained at the end of the intervention. These results are comparable to the findings of a meta-analysis into the effects of exercise on balance related activities (Allen et al., 2011). They indicate that highly challenging balance training, such as dance, is superior to other exercise interventions in improving functional balance activities. Dancing requires participants to use postural control muscles to stabilize the body before muscles responsible for executing movement are activated. The patterns of starts,

stops, side steps and backwards walking, challenge the body's ability to anticipate and respond to the different tasks and environmental constraints (Howe, 2011). Strength, posture and an ability to initiate corrective stepping strategies when balance is challenged are essential to maintaining balance (Maki and McIroy, 2005).

Postural stability was a commonality found in the literature. Yarnall et al. (2011), state that attentional deficits and risk of falls are strictly associated with an incapability of the patient to focus on motor/postural and cognitive tasks when they are combined. Dance therapy, for its intrinsic characteristics, might train the subject to properly address such tasks (Yarnall et al., 2011; Sarter et al., 2014). Kattenstroth (2010) also explains that cultural activities, including music, singing, and dance have been reported to have an important impact on health and life style and dancing in elderly individuals improves cardiovascular parameters, muscle strength, of posture and balance and of cognitive abilities. Ventura et al., (2016) added to this idea, stating that dance may be effective in targeting motor symptoms of PD because it incorporates the stretching and strengthening of muscles and increases flexibility throughout the body, which may help maintain balance in people with PD.

Exercise has been shown to improve motor impairments in aging populations, and may be especially important for people with PD due to emerging evidence supporting potential neuroprotective effects. Exercise adherence is a challenge and there are many perceived barriers to exercise in older adults, especially people with PD. However, dance is an accessible, appealing, and socially engaging mode of physical activity that provides measurable benefits in older adults and people with PD. Dance may be particularly beneficial in PD because it includes music, which can serve as an external cue to facilitate movement, and task-specific training of difficult movements like turning and backward walking. Dance also challenges dynamic balance

and targets strength, flexibility, and endurance (McNeely, Duncan, Earhart, 2015).

Although dance therapy is a new and upcoming form of treatment in field of physical therapy, studies show consistent results. Improvements have been noted in the motor functions mentioned above, as well as quality of life. Changes in mood, self-acceptance, social inclusion, and confidence have been noted as a result of dance therapy. It is hypothesized that improvements in the quality of life of patients with Parkinson's disease will impact seeking of treatment services and treatment outcomes. Therefore, it is the responsibility of the speech-language pathologist to navigate through therapeutic approaches options to select the most effective plan of care for each patient.

CHAPTER III

ROLE OF THE SPEECH-LANGUAGE PATHOLOGIST

Oral communication is vital in education, employment, social functioning and self-expression. The prevalence of disordered communication is particularly high (89%) in the nearly seven million individuals worldwide with Parkinson's disease (PD). The reduced ability to communicate is considered to be one of the most difficult aspects of PD by many people with the disease and their families. Affected individuals often become disabled or retire early, are forced to give up activities they enjoy, incur substantial medical costs and have increased mortality.

The role of the speech-language pathologist is primarily to describe and characterize the features of the voice, determine if the features differ from the norm, and, if a disorder is present, explore intervention approaches that will improve the client's voice and quality of life. The speech-language pathologist will also make recommendations and referrals as appropriate. This section marks the importance of promoting a greater understanding of culturally-based perspectives regarding assessment and treatment patients with voice impairments, as a result of Parkinson's disease.

Cultural Competence

Cultural competence involves understanding and appropriately responding to the unique combination of cultural variables and the full range of dimensions of diversity that the professional and client/patient/family bring to interactions. ASHA (2017) states "culture and

cultural diversity can incorporate a variety of factors, including but not limited to age, disability, ethnicity, gender identity (encompasses gender expression), national origin (encompasses aspects e.g., ancestry, culture, language, dialect, citizenship, and immigration status), race, religion, sex, sexual orientation, and veteran status. Linguistic diversity can accompany cultural diversity” (p. 3).

Developing cultural competence is a dynamic and complex process requiring ongoing self-assessment and continuous expansion of one's cultural knowledge. It evolves over time, beginning with an understanding of one's own culture, continuing through interactions with individuals from various cultures, and extending through one's own lifelong learning. ASHA provides resources on their website (i.e checklists, questionnaires) to promote cultural competence in health care professionals. In developing cultural competence, one should complete a self-assessment, including a review of the clinician's personal history, values, beliefs, and biases, develop an understanding of how these factors might influence perceptions of communication abilities and patterns, and developing an understanding of how personal perceptions might influence interactions and service delivery to a variety of clients/patients/families. ASHA as well states that the culturally competent clinician has the ability and responsibility to utilize evidence-based practice to include patient/family characteristics, clinician expertise, and empirical evidence in clinical decisions.

Cultural competence in service delivery is increasingly important to respond to demographic changes in the United States, eliminate long-standing disparities in the health status of people based on racial, ethnic, and cultural backgrounds, improve the quality of services and health outcomes, and meet legislative, regulatory, and accreditation mandates. The working definitions of cultural competence generally held that minorities have difficulty getting

appropriate, timely, high-quality care because of language barriers and that they may have different perspectives on health, medical care, and expectations about diagnosis and treatment. Achieving cultural competence in health care would “help remove these barriers, supplanting the current one-size-fits-all approach with a system more responsive to the needs of an increasingly diverse population” (Betancourt, Green, & Carrillo, 2002, pp. 3).

The complexity of the different types, causes, and symptoms of voice disorders is astounding. Voice disorders affect individuals of all ages, gender, races, and occupations. Demonstrating cultural competence and sensitivity in assessing and treating patients ensures an individualized and appropriate plan of care, impacting treatment outcomes.

Speech-language pathologists should be aware of the scope of practice as outlined by ASHA. The scope of practice in speech-language pathology comprises eight domains of service delivery and five domains of professional practice. Service delivery includes collaboration, counseling, prevention and wellness, screening, assessment, treatment, modalities, technology and instrumentation, and population and systems. Professional practice includes advocacy and outreach, supervision, education, administration and leadership, and research (ASHA, 2016).

Assessment

Clinical approaches—such as interview style, assessment tools, and therapeutic techniques—that are appropriate for one individual may not be appropriate for another. It is important to recognize that the unique influence of an individual's cultural and linguistic background may change over time and according to circumstance (e.g., interactions in the workplace, with authority figures, within a social context), necessitating adjustments in clinical approaches (ASHA, 2017).

Prior to assessing and/or treating a patient, speech-language pathologists should complete self-assessment to consider the influence of one's own biases and beliefs and the potential impact on service delivery. After completing a self-assessment, clinicians can begin identifying appropriate intervention and assessment strategies and materials that do not violate the patient's or family's unique values and/or create a chasm between the clinician and the patient, family, or community.

Assessment protocol may include perceptual measures of voice and oromotor function, articulatory precision, speech intelligibility, and acoustic measures of vocal sound pressure level, phonation time and pitch range. Measuring the severity of a voice disorder is difficult. As previously mentioned, methods have ranged from subjective measures of voice disorder severity including perceptual judgments (e.g., grading of voice quality as mild, moderate, or severe) to objective measures of voice characteristics (e.g., videostroboscopic findings and physiological measure of voice compared to normative data).

After obtaining case history and completing formal and informal voice assessments, it is further recommended that each patient receives a laryngeal evaluation by an otolaryngologist prior to initiation of treatment as part of best practice to confirm a diagnosis of voice changes secondary to Parkinson disease and eliminate the possibility of vocal fold disease other than that associated with Parkinson disease such as gastro-esophageal reflux disease or unilateral vocal fold paralysis (Shiple & McAfee, 2016).

Treatment

Current treatments for voice disorders in patients with PD consist of pharmacological treatments, surgical intervention, behavioral speech therapy, such as LSVT LOUD, or a combination thereof. While evidence for these treatments are statistically significant, it should be

noted that group data will not always apply to the individual patient. Along with selecting the course of treatment, speech-language pathologists have a major role implementing professional practice into their intervention plan.

Clinicians have a responsibility to advocate on behalf of consumers, families, and communities at risk for or with communication disorders and differences, swallowing, and/or balance disorders. Advocacy specific to cultural competence can be achieved in many ways. First, speech-language pathologists (SLPs) should collaborate with professionals across disciplines and with local and national organizations to gain knowledge of, develop, and disseminate educational, health, and medical information pertinent to particular communities. Second, SLPs should gain knowledge and education of high risk factors (e.g., hypertension, heart disease, diabetes, fetal alcohol syndrome) in particular communities and the incidence and prevalence of these risk factors that can result in greater likelihood for communication disorders. Third, SLPs should provide education regarding prevention strategies for voice disorders in particular communities. Fourth, SLPs should provide appropriate and culturally relevant consumer information and marketing materials/tools for outreach, service provision, and education, with consideration of the health literacy, values, and preferences of communities. Lastly, SLPs should identify and educate communities regarding the impact of state and federal legislation on service delivery (Valdez et al., 1993).

Developing cultural competence to assess and treat patients of a multicultural population is the ethical and professional responsibility of a speech-language pathologist. However, the responsibility to advocate for patients should also be held paramount. Only by completing these tasks will the disparities of service provision of minority populations be lessened.

CHAPTER IV

METHODOLOGY AND FINDINGS

Introduction

Chapters 2 and 3 highlighted both the critical need for evidence-based practice for voice treatment other than LSVT in the field of speech-language pathology and the current lack of systematic, empirical research on the benefits of dance therapy on voice in patients with Parkinson's disease. These two conditions were primary motivations for the researcher. To address the goals of this study, the researcher developed a multi-method research strategy that supported the exploratory and descriptive nature of the research. This chapter discusses the overall study design and the study's data collection and data analysis activities used to collect sufficient data to answer the study's research question. This chapter also highlights methodological issues and limitations encountered by the researcher.

Research Design

For the purpose of this project, the researcher integrated both qualitative and quantitative techniques in selecting the research design. A qualitative research design is generally based on a social constructivism perspective. Interpretation is based on a combination of researcher perspective and data collected. Most studies that utilize a qualitative research design generally include a small sample size. Qualitative researchers are concerned with making inference based

on perspective rather than statistics. In a qualitative research design, the researcher may opt to include interviews, observations, document analysis, biographical studies, phenomenology, grounded theory, ethnography, or a case study in collecting data (Creswell, 2013).

A quantitative research design is a formal, objective, systematic process for obtaining information about the world. A method used to describe, test relationships, and examine cause and effect relationships. Most studies that utilize a quantitative research design generally include a larger sample size. Quantitative research uses measurable data to formulate facts and uncover patterns in research. Quantitative data collection methods are much more structured than qualitative data collection methods and can include various forms of surveys – online surveys and paper surveys, face-to-face interviews, telephone interviews, longitudinal studies, website interceptors, online polls, and systematic observations (Slevitch, 2011).

The researcher integrated both qualitative and quantitative research methods to create and implement a survey research design to investigate the effects of dance therapy on voice in patients with PD. The broad area of survey research encompasses any measurement procedures that involve asking questions of respondents. The most common survey research types include questionnaires and interviews. A questionnaire was selected for this study to gather detailed responses from the participants and more accurately represent the findings. To review, a questionnaire is a research instrument consisting of a series of questions, or other types of prompts, for the purpose of gathering information from respondents. In developing the questionnaire for this research, many components of a questionnaire were meticulously reviewed to ensure validity of the research.

Instrument for Data Collection

The researcher developed a series of questions to (1) illustrate the demographics of the participants and (2) identify any previous experience with dance therapy as an intervention for

PD. As a first step in developing this questionnaire, a literature search on previously used validated questionnaires administered in similar settings and captured variables of interest according to the study hypothesis was conducted. Questions were extracted from questionnaires used in different studies by Westheimer et al., 2015 and Bognar et al., 2016. The Voice Handicap Index (VHI), created by Jacobson, Johnson, Grywalski, Silbergleit, Jocenson, and Michael S. Benninger, was used in conjunction with these questions to better document the perceived benefits of dance therapy on the voice of patients with PD.

The Voice Handicap Index (VHI) was designed to quantify the psychosocial consequences of voice disorders. It consists of three subscales: the functional prompts evaluate the impact of a person's voice on daily activities, the emotional prompts evaluate the client's affective response to his or her voice, and the physical prompts evaluate the client's own perceptions of vocal quality. Altogether, this 30-item questionnaire measures the influence of voice problems on a patient's quality of life (Shiple & McAfee, 2015).

Validity is the degree to which an assessment measures what it is supposed to measure. Validity is a complex topic and it is beyond the scope of this paper to explain it in detail, however to make the readers acquainted we have described it briefly. Essentially there are three types of validity 1) content validity, 2) criterion- related validity, and 3) construct validity. A questionnaire undergoes a validation procedure to make sure that it accurately measures what it aims to do, regardless of the responder. Valid questionnaire helps to collect better quality data with high comparability which reduces the effort and increase the credibility of data. A valid questionnaire must have following characteristics (i) simplicity and viability, (ii) reliability and precision in the words, (iii) adequate for the problem intended to measure, (iv) reflect underlying theory or concept to be measured, and (v) capable of measuring change.

The types of questions, the questionnaire style and appearance, and mode of administration were all reviewed in the literature search in developing the questionnaire. Questions pertaining to demographic information and previous dance therapy experience were structured to where all patients were asked the same questions. An open-ended question was included for participants to disclose personal experiences or opinions, not expressed through the structured questions. Questions were organized in a clear, simple, and easy to understand format, in a way that they can easily be understood by participants of different educational levels and cultures.

Population of the Study

A sample of 18 individuals with PD who participated in the Balance Exercises Support Team (B.E.S.T.) at the Rio Grande Regional Hospital in McAllen, Texas were recruited. Participants met the following inclusion criteria: (i) identified as living with PD; (ii) participated in the B.E.S.T class; (iii) able to speak and understand English or Spanish or had a translator (family or friend) available; (iv) able and willing to participate in a 10-minute interview; (v) able to provide informed consent.

B.E.S.T. Dance Therapy Content

Hour-long exercises classes are held on Tuesdays every month at the Rio Grande Regional Hospital Rehabilitation Outpatient Therapy center. The B.E.S.T is led by Jocelyn McDonald, PT, DPT, C/NDT, NTMC, CLT-LANA. The routine performed at the time of data collection included a warm-up routine of standing sequences, followed by a rendition of “Feeling Good” by Michael Bublé. This rendition included seated movements of limbs, tapping feet, and story-telling through music and dance.

During the rendition, Dr. McDonald performed the routine in the middle of the room, where all of the participants were able to see. She provided cueing when changes in movements were nearing and emphasized exaggeration in each movement, to increase range of motion. She as well provided cueing for postural stability, reminding each patient to be aware of their posture and body in space. As mentioned, the participants are seated throughout the rendition to minimize risk of falling. When the participants were asked to stand, such as during the warm-up, a chair was placed in front of each participant to provide support.

Method of Data Collection

Data was collected through face-to-face interviews using structured demographic questions and a structured 30-item questionnaire (VHI) after the dance therapy routine. As previously stated, questions for the questionnaire were derived from the study objectives and informed by previous literature. The completion of the questionnaire lasted 30 minutes in length and was conducted in the exercise room at the center. The researcher thoroughly explained the consent form and breakdown of questionnaire prior to asking the participants to complete the questionnaire. The researcher distributed the questionnaires to the participants who were present to be increase the high-response rate and to provide clarification for the meaning of questions the respondents were unclear about. Caregivers present were asked to assist their partner in the case that the individual was unable to physically complete the responses.

Method of Data Analysis

The data obtained was analyzed via quantitative analysis via Microsoft Excel. Data was reported anonymously via descriptive statistics. The frequency of the participants' responses and central tendencies, including mean, median, and mode, were analyzed.

Results

Table 1 shows demographic characteristics of the respondents: 18 participants, 14 male and 4 female, enrolled in the study and were included in the analysis. 16 subjects were White and 2 participants were Hispanic. Age range of participants was 36-75+ years. 14 participants reported to be 75+ years, 3 reported to be 60-74 years, and 1 reported to be 36-46 years of age. Table 2 shows Clinical Features of PD as reported by the respondents: Age range for diagnosis of PD was 58-70 years of age. 11 participants reported to have been diagnosed at 70+ years of age, 6 at 58-69 years of age, and 1 participant did not report their age of diagnosis. The range of Hoehn and Yahr stage was I-IV with a mean Hoehn and Yahr stage at stage 2-3. Participants were asked to report how long they had been attending dance therapy. 3 participants reported to have attended dance therapy for 3-4 years in length, 5 participants reported 1-2 years, 1 reported 7-12 months, 4 reported 2-6 months, and 5 reported less than 1 month. Lastly, When asked if the participants had received previous speech therapy services, 10 participants reported “yes” and 8 participants reported “no”.

Figure 3 shows the participants’ perceptions on the effects of dance therapy on their voice: 8 participants reported their voice to be “Better” after dance therapy, 1 reported their voice to be “Much Better” after dance therapy, and 9 participants reported their voice to have had “No Change” since the start of dance therapy. There were no negative responses, “changed for the worse”, as a result of attending dance therapy. In the questionnaire, participants were asked a question via open-ended format to report whether they feel dance therapy has impacted their quality of life. Table 3 shows the responses to interview questions: 10 participants reported they did feel dance therapy impacted their quality of life, leaving comments, such as, “Strengthening muscles. Reminds me to sit/stand straight. Diaphragmatic breathing important to use loud voice” and “Yes, my balance seems better”.

VHI scores reflected a wide range of impairments. The Self-Perceived Voice Severity per the Voice Handicap Index was utilized to illustrate the severity level according to scores yielded from the VHI. The scores yielded from this study for the Self-Perceived Voice Severity per the Voice Handicap Index is as follows: Mean VHI composite score was 40 (Mild), mean Functional subscale score was 16 (Moderate), mean Physical subscale score was 13 (WNL), and mean Emotional subscale score was 13 (Mild). In conclusion, research findings revealed half of the participants observed a change in their voice as a result of dance therapy, and the other half reported to observe no change in their voice production.

CHAPTER V

SUMMARY AND CONCLUSION

Discussion

This study explores the perceptions of changes in voice in individuals living with PD regarding their participation in dance therapy via the Balance Exercises Support Team (B.E.S.T). While others have examined effects of therapeutic dance programs on motor ability and quality of life measures, this study was intended to examine effects of therapeutic dance programs on voice in individuals with PD. This study establishes that effects of the program are multifaceted and contributes to the understanding of complex connections between physical, social and emotional well-being in PD. Major themes include: improved balance, louder voice, strengthening of muscles, and awareness of diaphragmatic breathing.

The findings in this study show that some participants (n=9) did find perceived benefits of dance therapy on voice in patients with Parkinson's disease. However, it is also important to focus the attention to a group of responses from the participants. When asked whether participants felt dance therapy had improved their quality of life, participant #3 stated "Yes. Being part of the group" and participant #4 stated, "Yes, I am still able to live alone". Those responses alone mark a significant benefit in this study. The social interaction gave these participants a feeling of inclusion and independence. It played a crucial role in allowing participants to foster relationships, to have fun together, to find out about how others were coping with their condition, and to gain confidence in moving with others with similar

challenges. In choosing to be active physically, cognitively and socially people with Parkinson's can improve their outcome of quality of life whatever their disease severity (Shulman, 2011). Dancing offers physical exertion, which also can be challenging and stimulating intellectually and emotionally, but despite the outcomes, it offers possibilities of social interaction.

Dancing can be seen as a successful motivator to encourage physical and social activity. We conclude that it could be useful in particular for those who do not like repetitive exercise regimes, who are socially isolated, who lack confidence, or who have limited movement capabilities, as well as those who enjoy cultural pursuits. This study points to a project that participants engaged with on several levels. Their experience was not just physical, but emotional, intellectual and social.

“Many participants expressed a loss of identity and control, which has been linked to the unpredictable nature of PD and is common in those living with chronic illness. Changes in lifestyle and activities following a PD diagnosis prompt changes to individuals' perceptions of themselves and their relationships with others. This can lead to depressive symptoms and social anxiety, which are predictors for poor quality of life in people with PD. Participants described positive changes in perspective and attitude because of participation in Dancing with Parkinson's (DWP), which helped them take a proactive approach to self-management. These findings support evidence that psychological adjustment to disease, as well as behavioral factors, impact health-related quality of life, potentially even more so than severity of disease. Addressing items related to psychological adjustment such as self-esteem, depression, attitude toward disease and feelings of self-efficacy may improve quality of life” (Westheimer et al., 2013).

In addition, the belief that one's own actions can influence health outcomes may promote behaviors that maximize function, potentially modifying disability progression. Feelings of

success can increase perception of control over illness and thus improve psychological adjustment. Bognar et al. (2016) observed that individuals with PD who were knowledgeable about their disease, practiced self-care, and engaged in activities, had a higher internally-oriented locus of control. The results suggest that participation in the DWP program can facilitate a positive change in perspective and attitude toward a PD diagnosis, increase feelings of self-efficacy and self-management of the disease, and subsequently improve quality of life. Participants in their study emphasized the importance of the social connections they created with classmates, which may act as a motivator for continued participation and improve overall sense of enjoyment in life. The same connection was made in this study.

Another interesting observation from this study surrounds the sample of the study. Although this study was intended to determine the effects of dance therapy on voice in individuals with PD in a multicultural population, there were only two racial groups identified in the sample, White (16 participants) and Hispanic (2 participants). Why is there such a low number of Hispanics participating in dance therapy groups, such as B.E.S.T.? The low number of Hispanic participants may be related to the perceived barriers Hispanics face obtaining health care or due to a decreased awareness of symptoms, support, and treatment resources as previously discussed in the literature review.

As the number of minority populations grows, measures should be taken to increase awareness of PD and promote participation in support groups, dance therapy or other forms of exercise groups, and other resources. As previously discussed, LSVT Loud is not ideal for every individual with PD, partly due to the limited accessibility due to lack of financial means, or inability to attend all the sessions. When working with a different cultural group, it is important to consider the patient's norms, accessibility to resources, and perspective on the intervention. As

professionals, it is our responsibility to not only educate the patient on the disorder they are presenting with, but bridge the gap between them and resources and encourage and promote participation in activities that are proven to provide benefits to their symptoms.

Valdez et al., (1993) discussed several recommendations that could be made to increase cultural competence, especially in the Hispanic population. As outlined in Chapter 3, speech-language pathologists (SLPs) should collaborate with professionals across disciplines and with local and national organizations to gain knowledge of, develop, and disseminate educational, health, and medical information pertinent to particular communities. Second, SLPs should gain knowledge and education of high risk factors (e.g., hypertension, heart disease, diabetes, fetal alcohol syndrome) in particular communities and the incidence and prevalence of these risk factors that can result in greater likelihood for communication disorders. Third, SLPs should provide education regarding prevention strategies for voice disorders in particular communities. Fourth, SLPs should provide appropriate and culturally relevant consumer information and marketing materials/tools for outreach, service provision, and education, with consideration of the health literacy, values, and preferences of communities. Lastly, SLPs should identify and educate communities regarding the impact of state and federal legislation on service delivery.

For the purpose of this study, an educational flyer with information about Parkinson's disease was created in Spanish to relay information to Hispanic populations, in hopes of increasing awareness in the Rio Grande Valley. The researcher intends to distribute this flyer to health clinics, hospitals, and rehabilitation centers around the Rio Grande Valley to allow patients with Parkinson's disease and their families to learn about Parkinson's disease and the support groups around their community.

If speech-language pathologists, and all other health professionals, continue to participate in professional practice measures, such as advocating for patients when awareness and education of diseases are observed to be decreased, or investigating the benefits of new treatment options when evidence-based and culturally-sensitive intervention options are limited, disparities of service provision of minority populations will finally diminish.

Limitations

There were several limitations to this study. First, this study involved one type of dance program and findings may not necessarily transfer to other programs. However, many components of B.E.S.T. are common to all dance classes, such as music and core support. Second, it should be considered that the intensity and frequency of the dance intervention may not have been sufficient to achieve a meaningful benefit. The participants in this project may have not had enough consistent exposure to the dance sessions to gain significant levels of strength and proprioception that would improve their balance and stability scores.

Third, detailed data on changes in daily exercise or other co-interventions, and/or medication intake that may have occurred was not collected. Fourth, this thesis used a combination of subjective qualitative and quantitative measures. To obtain detailed numerical data, quantitative measures, such as scales and acoustic measures should be utilized to detect physical changes in voice production.

Future Considerations

The purpose of this study was to evaluate the benefits of dance therapy related to voice production in patients with Parkinson's disease based on literature findings and perceptual measures. Our results highlight the need for future research to examine the effects of dance therapy on voice in individuals with Parkinson's disease in a multicultural population. In

addition, future research in the management of chronic illnesses and movement disorders may also help determine if dance therapy is also beneficial for special populations other than PD.

Future investigations include a larger and more diverse sample to identify whether results are consistent and can be comprehensible and generalized in multicultural populations.

Additionally, caregivers' experiences could also be explored to provide a third-party perspective.

Past research has determined that physical gains are associated with regular participation in dance programs for PD. Therefore, it would be of value to study the effects and the benefits of dance programs as perceived by participants through an in-depth interview via a qualitative design study. This could provide a better understanding of the relationship between perceived impact on quality of life and improvements in voice described by the participants in this study.

Lastly, one might speculate that the degenerative process of Parkinson's played a part in this result. Further investigation is needed to expand on this observation, suffice to say that whether the balance results were a consequence of increase in strength, proprioception and body awareness, or an increase in movement confidence, this specific project indicates positive development of people's ability to carry out tasks that challenge stability and balance irrespective of participation in other activities.

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APPENDIX A

APPENDIX A

GLOSSARY OF TERMS

Abduction: Movement of a limb away from the midline of the body.

Adduction: Movement of a limb toward the midline of the body.

Akinesia: Loss or impairment of a voluntary activity (as of a muscle).

Basal ganglia: A region of the base of the brain that consists of three clusters of neurons (caudate nucleus, putamen, and globus pallidus) that are responsible for involuntary movements such as tremors, athetosis, and chorea.

Bradykinesia: Impaired ability to adjust the body's position due to extreme slowness of movements and reflexes.

Cerebellum: The portion of the brain that is in the back of the head, between the cerebrum and the brain stem. It is involved in the control of voluntary and involuntary movement as well as balance.

Degenerative neurological disorders: Inappropriate function of the peripheral or central nervous system due to impaired electrical impulses throughout the brain or nervous system.

Dopamine: A monoamine neurotransmitter formed in the brain by the decarboxylation of dopa and essential to the normal functioning of the central nervous system.

Dysarthria: Difficulty in articulating words due to disease of the central nervous system; characterized by slurred or slow speech that can be difficult to understand.

Dyskinesia: Involuntary, erratic writhing movements of the face, arms, legs or trunk.

Dystonia: Sustained or repetitive twisting or tightening of muscle.

Festination: Short, rapid steps taken during walking. May increase risk of falling and often seen in association with freezing.

Gait: A manner of walking or moving on foot.

Hypokinesia: Abnormally decreased muscular movement.

Hypomimia (Masked Face): Results from the combination of bradykinesia and rigidity.

Hypophonia: An abnormally weak voice due to incoordination of the muscles concerned in vocalization.

Hypoprosodia: Reduced prosodic pitch inflection.

Larynx: A muscular and cartilaginous structure lined with mucous membrane at the upper part of the trachea, in which the vocal cords are located.

Micrographia: Small, untidy and cramped handwriting due to bradykinesia.

Parkinson's Disease: A chronic progressive neurological disease that is linked to decreased dopamine production in the substantia nigra and is marked especially by tremor of resting muscles, rigidity, slowness of movement, impaired balance, and a shuffling gait.

Rigidity: Stiffness or inflexibility.

Sialorrhea: Excessive saliva or drooling may result due to a decrease in normally automatic actions such as swallowing.

Speech-Language Pathologist: A specialist who evaluates and treats patients with speech, language, cognitive-communication and swallowing disorders in individuals of all ages, from infants to the elderly.

Vocal Folds: Folds of membranous tissue that project inward from the sides of the larynx to form a slit across the glottis in the throat, and whose edges vibrate in the airstream to produce the voice.

APPENDIX B

APPENDIX B

TABLE 1: DEMOGRAPHIC CHARACTERISTICS

Participant	Gender	Age	Ethnicity
1	Female	75 years+	Hispanic
2	Male	75 years+	White
3	Male	75 years+	White
4	Female	36-46 years	White
5	Male	75 years+	White
6	Male	75 years+	White
7	Male	60-74 years	Hispanic
8	Male	75 years+	White
9	Male	75 Years+	White
10	Female	60-74 years	White
11	Male	75 years+	White
12	Male	75 years+	White
13	Female	75 years+	White
14	Male	75 years+	White
15	Male	60-74 years	White
16	Male	75 years+	White
17	Male	75 years+	White
18	Male	75 years+	White

APPENDIX C

APPENDIX C

TABLE 2: CLINICAL FEATURES OF PD

Participant	Age of Diagnosis	PD Stage	Dance Therapy Experience	Previous Speech Therapy
1	70+ years	Stage III	1-2 years	No
2	58-69 years	Stage III	1-2 years	No
3	70+ years	Stage I	3-4 years	Yes
4	No response	Stage I	1-2 years	No
5	70+ years	Stage I	2-6 months	No
6	58-69 years	Stage III	Less than 1 month	Yes
7	58-69 years	Stage III	1-2 years	Yes
8	58-69 years	Stage II	Less than 1 month	Yes
9	70+ years	Stage IV	3-4 years	No
10	58-69 years	Stage I	2-6 months	Yes
11	70+ years	Stage III	1-2 years	Yes
12	70+ years	Stage III	Less than 1 month	Yes
13	70+ years	Stage I	3-4 years	No
14	70+ years	Stage III	2-6 months	Yes
15	70+ years	Stage I	2-6 months	Yes
16	70+ years	Stage III	Less than 1 month	No
17	58-69 years	Stage I	7-12 months	No
18	70+ years	Stage II	Less than 1 month	Yes

APPENDIX D

APPENDIX D

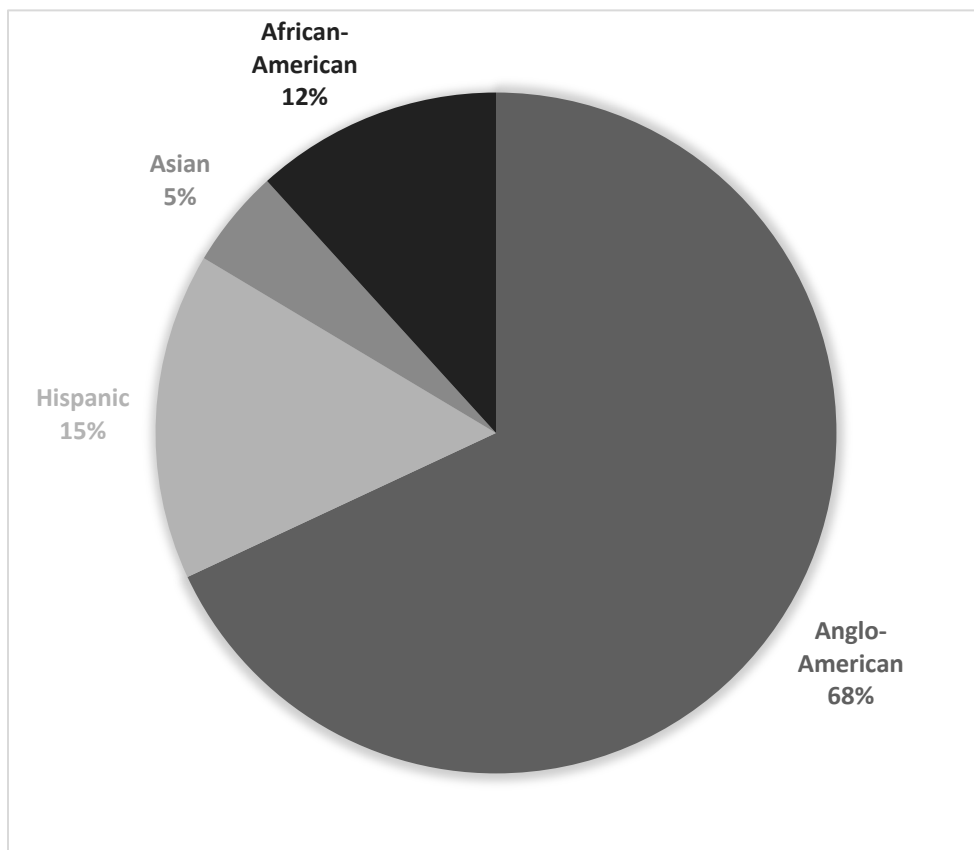
TABLE 3: RESPONSES TO INTERVIEW QUESTIONS

Participant	Do you feel these dance therapy classes have improved your quality of life? If so, explain:
1	N/A
2	Probably.
3	Yes, being part of the group.
4	Yes
5	Not really. I think improvement can be achieved by combining voice with physical exercise.
6	No.
7	Yes.
8	<i>No response.</i>
9	Yes because of mandatory exercise
10	Yes. Strengthening muscles. Reminds me to sit/stand straight. Diaphragmatic breathing important to use loud voice.
11	No.
12	<i>No response.</i>
13	Yes, I am still able to live alone.
14	Improved balance.
15	Yes, my balance seems better.
16	<i>No response.</i>
17	I didn't like the voice work at first, but now I enjoy it.
18	<i>No response.</i>

APPENDIX E

APPENDIX E

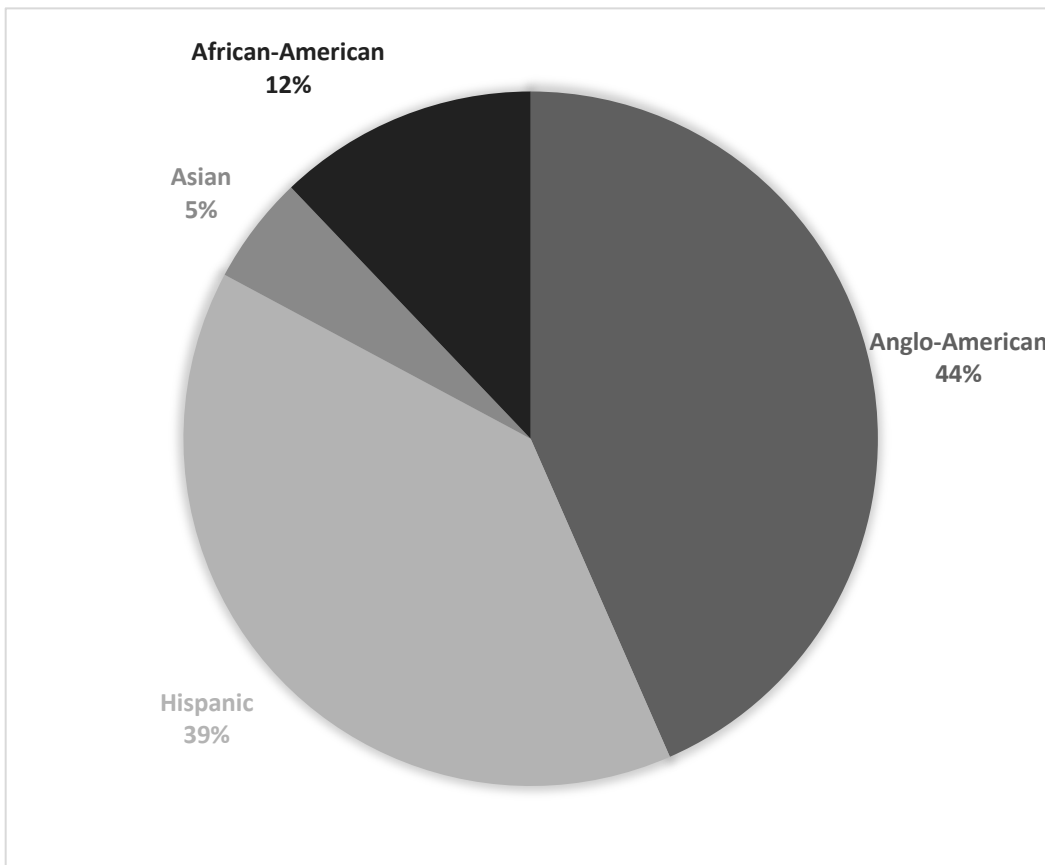
FIGURE 1: U.S. Demographics



APPENDIX F

APPENDIX F

FIGURE 2: Texas Demographics



APPENDIX G

APPENDIX G

FIGURE 3: PARTICIPANTS' PERCEPTIONS OF DANCE THERAPY EFFECTS ON VOICE

Participant	Difference in Voice
1	No change
2	No change
3	No change
4	No change
5	No Change
6	No Change
7	Better
8	Better
9	Better
10	Better
11	No change
12	Better
13	No change
14	No change
15	Better
16	Better
17	Much Better
18	Better

BIOGRAPHICAL SKETCH

Ivon Ramirez attended The University of Texas Rio Grande Valley from 2012 to 2016, where she received a Bachelor's of Science Communication Sciences and Disorders. She then continued at The University of Texas Rio Grande Valley from 2016 to 2018 where she obtained her Master's of Science in Communication Sciences and Disorders.

Ms. Ramirez is passionate about the field of speech-language pathology. She has served as the President of the National Student Speech Language Hearing Association at UTRGV, where she organized volunteer events for the community. She has traveled abroad to Dublin, Ireland, in completion of a Seminar in Speech-Language Pathology course, in which she was exposed to multicultural issues. She has given presentations about speech-language pathology at the local, state, and national level, on the following projects: Effective Language Treatments for Children with Autism and The Efficacy of Milieu Teaching in Spanish-Speaking Children with Language Disorders.

Additionally, she has an interest in neurological disorders, dysphagia, multicultural issues, and early intervention. She hopes to continue doing research in the future to further expand the body of knowledge in these areas. Her thesis, The Effects of Dance Therapy on Voice in Patients with Parkinson's Disease in a Multicultural Population, aims to contribute to evidence-based treatment options for voice in individuals with Parkinson's disease and increase awareness and provide resources for individuals with Parkinson's disease in the Hispanic population. She can be contacted at ivonnavit03@gmail.com.