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Collaboration of Music Therapy and Physical Therapy: A Case Study for Treatment of a Patient with Chronic Stroke

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This Scholarly Project, submitted by Matthew Aymond and Michelle Sanders in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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(Graduate School Advisor)

(Chairperson, Physical Therapy)

PERMISSION

Title Collaboration of Music Therapy and Physical Therapy: A Case Study for Treatment of a Patient with Chronic Stroke

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TABLE OF CONTENTS

LIST OF TABLES

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ABSTRACT

Background and Purpose: Stroke is one of the leading causes of death in the United States and can cause severe, debilitating, and lasting effects. Although a fair amount of research has been performed on treatment of individuals following a stroke, few studies exist looking at the collaborative efforts of physical therapy and music therapy.

Case Description: This case follows the 13-week interdisciplinary care of an 83-year old female patient with chronic impairments following a cerebrovascular accident suffered approximately 2 years prior.

Interventions: Following an initial evaluation, the patient performed 11 one-hour treatment sessions over an 11-week period. The patient was co-treated during each session by a music therapy student and two physical therapy students under the direction of a licensed music therapist and a licensed physical therapist. Interventions included gait training with rhythmic auditory stimulation, balance training, lower extremity and core strengthening, and overall quality of life through music.

Outcomes: After 11 weeks of interventions the patient was reassessed and outcomes were recorded. The patient demonstrated increased competency on the Berg Balance Scale and Short Form-36 as well as decreased timed up-and-go and 5 Time Sit to Stand times, and an increase in her comfortable gait speed.

Discussion: Collaboration of treatment between music therapy and physical therapy led to improvements in functional mobility, gait speed, and quality of life for this individual with chronic stroke.

CHAPTER I

BACKGROUND AND PURPOSE

Stroke, also known as cerebrovascular accident (CVA), is the fifth-leading cause of death in the United States with over 128,000 deaths and nearly 800,000 occurrences annually in the United States.[1] Strokes occur when a blood vessel in the brain becomes blocked or ruptures, causing a loss of blood flow and oxygen to a certain area in the brain. Stroke is a leading cause of long-term disability and reduces mobility in more than half of stroke survivors over the age of 65.[1] Strokes can also lead to difficulties with speech, swallowing, balance, cognitive function, and mood.

Only 12% of patients post-stroke are fully independent with their activities of daily living (ADLs) after one week, so rehabilitation is an important aspect of health care for individuals after a stroke.[2] Physical therapy is a key part of this rehabilitation, usually beginning in the first days of the acute phase and possibly continuing into the chronic phase of stroke. However, research regarding stroke rehabilitation published in 2014 found that only 30.7% of survivors of a stroke participate in outpatient rehabilitation after discharge from inpatient services.[2]

In addition to the physical disabilities, 30% of patients have depressive symptoms either in early or late stages following their stroke.[2] This psychological aspect of disability is commonly ignored but needs to be addressed. One way to address the depression and cognitive effects of stroke without using additional medications is through music therapy. [3]

Music therapy is an established health profession in which music is used within a therapeutic relationship to address physical, emotional, cognitive, and social needs of individuals.[4] One technique commonly utilized by music therapists for patients with neurological involvement is called Rhythmic Auditory Stimulation (RAS), a neurologic technique used to facilitate the rehabilitation of movements that are intrinsically and biologically rhythmical, such as gait.[4]

Eun-Mi Jun, Young Hwa Roh, and Mi Ja Kim[5] examined the effects of "music-movement therapy" on patients hospitalized following acute stroke. In comparison to the control group, the group receiving music-movement therapy demonstrated improved shoulder and elbow range of motion (ROM) on the affected side as well as improved psychological function and moods. Although this was not performed by music therapists and physical therapists, the findings of this study were positive in regard to music and movement in the recovery of patients with acute stroke both physically and psychologically.

In a study performed by Horne-Thompson and Bramley[6], researchers found that using music therapy as part of an interdisciplinary practice involving physical therapy improves functional outcomes. In this study, the researchers used the Edmonton Symptom Assessment Scale (ESAS) which looks at appetite, nausea, anxiety, tiredness, pain, well-being, and depression. The research team found that the subjects' ESAS scores and their mobility was maintained or showed significant improvement (assessed with De Morton Mobility Index) following 8 weeks of treatment.

Even though research has shown the benefits of music therapy, its use is still overlooked. In a 2010 article published in the American Heart Association Journal[7], researchers looked at comprehensive interdisciplinary care in the rehabilitation of patients following a stroke. The

writers listed the healthcare providers commonly associated with patients post-stroke. Even though music therapy has research to support its benefit for stroke recovery both psychologically and physically, music therapists were not on this list.

Although there is an increase in the amount of research being published about the effectiveness of music therapy, there is still a lack of research involving a combination of music therapy and physical therapy. Following a literature review, the student researchers of this study found no literature in which a combination of physical therapy and music therapy were used to treat chronic stroke. However, the student researchers did find that recent research has shown positive effects using music therapy techniques for treating patients with similar chronic neurological conditions to stroke such as Alzheimer's disease and Parkinson's disease.[8] Using this research, a plan was developed for interventions combining physical therapy and music therapy for a patient with chronic stroke to see if additional improvements could be made for this patient's functional independence and quality of life.

As a result, the purpose of this case report was to present a detailed description of the interdisciplinary treatment and rehabilitation outcomes of an 83-year-old female two years post-stroke. This patient's treatment was completed by two student physical therapists (SPTs) and one student music therapist (SMT) under the direct supervision of a licensed physical therapist and a licensed music therapist.

CHAPTER II

CASE DESCRIPTION

The patient was an 83-year-old, Caucasian, female who presented almost two years status-post right CVA. She has since had difficulty with gait, balance, left neglect, left arm function, and cognition. The patient has some cognitive deficits due to dementia, especially with short-term memory and following commands. She has received varying physical therapy treatments since the time of the CVA but has not achieved complete independence and requires 24-hour support from family and caregivers. The patient has 3 stairs to enter her home. She does not currently use any assistive device and relies on a caregiver using a gait belt for safety during ambulation. Her daughter informed the student therapists that she does have a wheeled walker and a single point cane available.

Initial Physical Therapy Examination

The patient was seen and assessed for functional mobility and quality of life. Functional testing consisted of the Berg Balance Scale (BBS), Cognitive Timed Up and Go (C-TUG), Timed Up and Go (TUG), and the Five Time Sit-to-Stand (FTSTS) test. Gross strength screening was completed but specific manual muscle tests were not performed as that was not the area of focus for this study. Quality of life (QOL) was assessed using the Short Form-36 (SF-36).

On the BBS, the patient scored a 15/56, requiring moderate assistance, placing her in the "high fall risk" category with a 71.4% impairment. Hiengkaew et al[9] reported a high test-retest reliability for the BBS (intraclass correlation coefficient = 0.95) for patients with chronic stroke

patients. This study also reported a high test-retest reliability with these patients on the TUG (intraclass correlation coefficient (ICC) = 0.97).[9] The patient in this study completed the TUG test in 58.0 seconds with minimal assist of one person.

The patient's time was much higher than the age related normal TUG time of less than 13.5 seconds for community dwelling adults. According to study findings by Mirelman et al[10], the increased time seen in this patient may have been partially due to her decreased cognitive function in addition to her stroke symptoms. This study looked at the effects of cognitive impairments on motor control by assessing scores on the TUG. The researchers found that patients with mild cognitive impairments did have increased times on the TUG due to complexity of the subtasks such as sit-to-stand and turning around a cone. This change was not noticeable in the overall test, but when examined in parts it was evident that the patients with cognitive impairments had increased difficulty with these tasks.

The Cognitive TUG was modified due to the patient's cognitive level. She was unable to count backwards from 100 by 7's while seated, but demonstrated the ability to count backward by 5's so that was used for this portion of the testing. The patient completed the test in 45.7 seconds with minimal assist of one person.

On the FTSTS, the patient was able to complete five sit-to-stands from a standard wheelchair in 38.66 seconds with moderate assist of one person and verbal cues to shift weight forward and stand completely upright. This is well above the 12.2 second cut-off between healthy elderly and elderly people post-stroke.[11] This finding is consistent with a study by Chou et al [11] investigating postural control during the FTSTS, in which the subjects with stroke had a longer sit-to-stand duration than the healthy elderly. This increase in time was due to their stroke-specific impairments such as lower-limb muscle weakness and balance deficits. The

patient used only her right arm to push up from the wheelchair. In a report by Mong et al[12] analyzing the reliability of the FTSTS test in patients with chronic stroke, the writers reported a better reliability range in subjects with stroke (ICC range, .971–.999) than those previously reported in community-dwelling elderly (ICC range, .640 –.960) and frail elderly (ICC=0.670). They also found that the FTSTS time significantly correlates with knee flexor muscle strength, but has no correlation with balance.

The patient's gait speed was measured using the GAITRite® system with contact guard assist of one person. The average of 2 trials was taken. The patient's cadence was 104.1 steps/minute and her self-selected velocity was 0.531 meters/second (m/s). This value placed her in the limited community ambulator range (0.4-0.8 m/s). The average self-selected gait speed for a female between the ages of 80-89 is 0.80 meters/second.[13] The patient walked with unequal step lengths with slightly longer steps on the right side. Comfortable walking speed also has high test-retest reliability for patients with chronic stroke with an ICC of 0.96.[9]

For a QOL questionnaire, the patient completed the Short Form-36. On this questionnaire the patient scored a 1795/3600 which indicated a 50.2% impairment.

Systems Review

During a review of systems, the patient demonstrated no concerning abnormalities with cardiopulmonary system or integumentary system. The musculoskeletal system showed gross weakness with greater weakness on the left side, some of which is likely due to the CVA impairment to the neuromuscular system. Postural deficits were noted in both sitting and standing posture. The patient demonstrated rounded shoulders and forward head posture. Impairments of the neuromuscular system included balance and gait difficulties.

Evaluation

After examination, the researchers determined the patient presented with problems in the areas of balance, altered gait with unequal step length, circumduction of the left leg during gait, decreased gait velocity, limited walking endurance, need of moderate assistance with transfers, cognitive impairment, flaccidity of the left upper extremity, and a 50% impairment in QOL based on the SF-36. The SMT did not find any need for sole music intervention upon her evaluation, but determined that music therapy would be beneficial for this patient in conjunction with physical therapy to help with gait and balance and improve overall QOL.

Goals for the patient were designed to improve balance, functional mobility, and endurance. Short-term goals were not a part of this plan of care as the patient is already in the chronic stage of stroke and quick progress is not expected. The patient had long-term goals set, all to be met within the twelve week period of this study. Long-term goals were agreed upon by both the patient and student therapists and are listed in Table 1.

Table 1. Long-Term Therapy Goals

Goal 1	Patient's score on the Berg Balance Scale will improve to a 21/56 to represent significant change in balance and coordination and reduce risk of falling.
Goal 2	Patient will be able to transfer sit-to-stand with standby assist (SBA) to maximize independence and reduce risk of falling.
Goal 3	Patient will be able to ambulate 150 feet SBA without a rest break to improve function as a community ambulator and get from car to buildings.
Goal 4	Patient's gait speed will increase to .60 m/s in order to allow her to get to the bathroom in a timely manner.
Goal 5	Patient's score on the SF-36 will improve to 1,975 (45% impairment) to demonstrate an improved QOL.
Goal 6	Patient's time on the TUG will improve to 55.0 seconds to demonstrate significant change, increase functional mobility with transfers, coordination, and reduce her risk of falling.
Goal 7	Patient's time on the five time sit-to-stand test will improve to 32 seconds in order to show improvement in functional mobility.

Diagnosis

After the evaluation was completed, the student therapists determined that the findings coincide with the patient's prior diagnosis of CVA with left-sided hemiparesis. The patient also demonstrated mild cognitive impairment, though this was not officially assessed with a tool.

Prognosis

It was the student researchers' opinion that the patient's prognosis was fair. Although she will likely never make a full recovery to her prior level of function, she is likely to return to a functional state to make ADLs easier on both the patient and her caregivers. Due to the patient's impaired cognition, it was difficult to give her a good or excellent level of prognosis.

Plan of Care

The patient's plan of care involved working with physical therapy and music therapy once a week for one hour sessions for 13 weeks. The first and last sessions were used for evaluation and re-evaluation with 11 weeks of intervention in between. Therapeutic interventions included therapeutic exercise, therapeutic activity to improve functional mobility, and gait training to improve balance and gait.

The patient was given a home exercise program (HEP) with handouts and a DVD video to continue exercises and activities at home between sessions. The patient was also given a CD of music at the proper speed for her to work on ambulation at home.

The SMT worked on gait mechanics using techniques of RAS to improve step length, cadence, speed, etc. Music therapy was also used to help the patient improve her QOL, cognition, and cue her for various exercise tasks. At the end of 13 weeks of interventions, the patient was reassessed on all functional measures and was discharged with an updated HEP to continue working on balance, lower extremity strength, and functional mobility.

CHAPTER III

INTERVENTION

During the 13 weeks of therapy, interventions were designed to help the patient achieve functional goals. Interventions included exercise to improve the patient's balance, muscle endurance, ambulation and gait mechanics, trunk rotation, and overall QOL. The student researchers also included interventions to increase the use of the left upper extremity, even though this was not specifically addressed in the goals.

Balance

In a study from 2002, Adomaitis[14] outlines effective balance interventions in an elderly population. The balance interventions used in this case report were adapted from Adomaitis's techniques. To address the patient's balance impairments, interventions began with reaching forward outside of her center of balance until her hips lifted off of the surface of a chair. She performed this activity 10 times with her hands placed in the prayer position. Her arms and hands were resting on a large physioball for additional support and to help decrease apprehension during this activity. This activity was used to help improve balance as well as initiating sit-to-stand motions. This activity was performed with RAS cues for standing (ascending chords) and sitting (descending chords) on the autoharp by the SMT.

Balance activities were progressed by having the patient perform 10 reaching exercises as well as seated marching exercises 15 times on each leg. She performed these exercises while

sitting on a Sitfit disc to provide an unsteady surface. This activity was aimed at increasing dynamic balance while in a seated position to ensure safety. The seated marching was progressed to standing marching performed with minimal assist of 1 SPT and while holding onto a supportive surface for confidence. When the patient was comfortable with standing marching, she progressed to standing toe taps onto a 6-inch wooden box. All of these activities were performed with the SMT providing RAS cues on the autoharp for lifting and lowering the legs and singing verbal cues for left and right legs.

Another intervention aimed at increasing balance for the patient was standing and reaching to tap a balloon. The SPT would toss a balloon to the patient and she was instructed to tap the balloon back. Balloon tosses were designed to make the patient move outside of her center of balance so she would be required to reach and maintain dynamic stability. In subsequent sessions, a variation of this activity was performed to keep it interesting and engaging for the patient. The patient was instructed to use a mallet to reach and hit paddle drums held by the SPT. The drums were held in a position so that the patient needed to reach outside of her center of balance. The drums were moved in a D1 flexion pattern (reaching up and across the body) to encourage trunk rotation for the patient. This activity was first performed in sitting and progressed to standing and eventually walking while performing the activity. In addition to balance, this intervention helped the patient to improve her trunk rotation and increase arm strength and motion. The patient used her right hand to assist her flaccid left arm through the reaching motions for all of these interventions.

To help increase dynamic balance, the patient worked on 360-degree turns in both directions. This was used to help her with functional turns as she demonstrated difficulties while turning during tasks such as car transfers, especially to her left side.

Muscle Endurance

To address the area of muscular endurance, interventions included several repeated activities. The first activity was repeated sit-to-stands. In an article by Kyung et al[15], the researchers found that sit-to-stand training for patients who have suffered a CVA using varying foot positions improves symmetric posture, balance, and muscular endurance. The patient performed these in a standard height chair without armrests. The patient was given verbal cues for preparing to stand including shifting her weight forward and holding her hands in the prayer position. She was also given verbal cues for returning to sit, including to reach back and find the chair and to lower herself down slowly versus falling back into the chair in an uncontrolled manner. One SPT provided MOA in the first sessions. The SMT provided musical cues with the autoharp in ascending and descending patterns as the patient stood up and sat down respectively. During subsequent sessions, cueing frequency was decreased and patient's improved strength led to less assistance required from the SPT, eventually progressing to CGA for sit-to-stands. At the end of treatment no verbal cues were given while performing sit-to-stands, but the musical cues continued.

Another activity the patient performed to improve muscular endurance was standing hip abduction. The patient stood while holding onto the SPT's hands (to increase confidence) and completed repeated hip abduction. The patient began with 5 repetitions to each side but progressed throughout the weeks to 10 repetitions for each lower extremity. One SPT held a tambourine to the patient's side and the patient was instructed to continue abducting her hip until she hit the tambourine with her foot. This provided a physical and auditory cue so the patient knew how far to abduct her lower extremity. The patient was also provided musical cues by the SMT with the autoharp and singing to help her maintain smooth and continuous motions.

To improve endurance and functional independence, the patient completed transfers from a standard chair to a wheelchair and vice versa. The patient completed this activity 5 times in each direction. She was given verbal cues as well as musical cues via the autoharp and her transfers improved with increased repetitions. The SPTs, as well as the patient's caretakers, noticed improvement in her car transfers before and after sessions.

Gait and Ambulation

Gait and ambulation were addressed during every session of the 13 week period. The goal of improving the patient's ambulation abilities was to increase functional independence and decrease demands on her caregivers. The pre-gait activities performed included strides in place with emphasis on taking a large first step, and returning to standing. These were used to help the patient initiate a large enough first step and find a rhythm while walking. These activities were performed with verbal cues for "large" and "tall" initial steps.

In an article by Jaffe et al[16], ambulation training, involving stepping over objects and increased walking distance, were found to improve gait velocity, stride length, walking endurance, and obstacle clearing capacity. Following pre gait activities, the patient advanced to working on gait activities. At the conclusion of each session, the patient walked around the classroom in 115 foot laps with contact guard assist (CGA) from a SPT. After the SPTs noticed improvement in her walking endurance and confidence, obstacles were added at various intervals around the lap. The obstacles placed around the room were not tall; either a single end cane laid on its side or a small piece of 2-3" foam. The patient was provided with CGA while performing all gait activities. She was provided with verbal cues for taking "big and tall steps" and/or "stand tall". Physical cues were used by an SPT placing one hand on the patient's anterior shoulder as a reminder to stand erect, as her posture tended to bend forward as she fatigued. During gait

activities, musical cues were provided by the SMT in the form of singing and playing the autoharp. During the later sessions, the musical cues were steadily decreased until the last session, in which no musical cues were given at all.

Another intervention used with the intent of improving gait was retro walking. Cha et al[17], found that walking backwards as an intervention leads to increased endurance, balance, and confidence during community ambulation. The patient performed this in small intervals of walking backwards for 10 feet. She received minimal assistance from one SPT and held onto the other SPT's hands in order to reduce fear associated with being unable to see where she was going. The patient was given verbal cues for step length and posture, as she preferred to bend forward and shuffle her feet. Musical cues were provided to help her take regular fluid steps and the SMT sang cues such as "right, back, forward, left, back, forward" to help keep the patient focused on the task.

Quality of Life

Interventions that were designed to improve QOL included therapeutic activity for increasing functional independence. In an article by Hsu et al[18], researchers found that using music therapy for patients with dementia can increase self esteem, mood, recollection, and can help retain information. Improving her QOL would improve independence at home, boosting her self-esteem, and would decrease demand on her caregivers. Increasing her functional mobility will also be effective in decreasing the risk of falls, which is so important in preventing injuries in the elderly population. The SMT also performed several interventions aimed specifically at increasing QOL, including playing songs during rest breaks and asking the patient interview questions to learn more about her and her likes/dislikes. The SMT also led some group cohesion musical experiences during sessions to help build rapport between the SMT, SPTs, and the

patient. During these group cohesion activities, the SMT would play guitar and sing a song, while the SPTs and the patient played various hand instruments.

Patient Education

During the treatment period, the SPTs provided the patient with a HEP in written form with pictures, a DVD video with verbal explanations, and a CD of music played by the SMT at her cadence for practice gait at home. The patient was also reminded during each session to maintain proper posture and use good form while performing all exercises. The patient's daughter and one caregiver were also educated on the HEP due to the patient's cognitive limitations.

CHAPTER IV

OUTCOMES

After evaluation an 11 subsequent sessions of therapy with the SMT and SPTs, a reassessment of the initial tests and measures was conducted. The findings are listed below in Table 2. The patient was discharged with an updated HEP after these 13 weeks.

Reassessment

The patient improved her scores on the TUG, FTSTS, SF-36, and CGS (see table 2). The patient's score on the BBS remained the same at 15/56; however, the SPTs noted improvements in the level of assistance required. The SPTs found that she required moderate assistance of one for balance on most of the tasks at initial evaluation, but during the final evaluation she required minimal assistance or contact guard assist of one on the tasks. The patient's time for the Cognitive TUG increased from 45.7 seconds to 54.95 seconds. The SMT was not present at the initial evaluation so there was no initial GAITRite® data with music, but at the discharge evaluation the SMT played music while the patient walked for one set of trials and sang with the music for another set of trials. Three of the seven long term goals for the patient were met at the end of 12 weeks with progress made on all seven goals. Reference Table 3 below for details.

Patient Satisfaction

The patient's family reported a subjective improvement in her gait speed during community ambulation and noted that she was no longer grabbing for furniture or other objects

when walking through her house. Her family members who observed a few of the therapy sessions also subjectively reported that her sit-to-stands were greatly improved. The patient herself did not fully answer questions regarding her satisfaction or feelings about her outcomes, but she did report quite a bit of pain on her left side when the sessions began. Toward the end of the 13 weeks, the patient had less pain and only reported occasional tingling, as if her left hand and leg "just needed to wake up."

Table 2. Assessment Outcomes

Test	Initial Eval	At Discharge	Age-Related Norms[13]
TUG	58.00 secs; (MIA)	35.34 secs; (CGA)	<13.5 seconds
Cognitive TUG	45.70 secs (MIA)	54.95 secs (CGA)	<15.0 seconds
FTSTS	38.66 secs (MOA)	22.81 secs (MIA)	17 seconds
BBS	15/56	15/56	42/56
SF-36	1795/3600	1925/3600	
CGS	0.53 meters/second (CGA)	0.59 meters/second (CGA)	0.80 meters/second
GS with Music	*not tested	0.534 meters/second	
GS with Singing	*not tested	0.564 meters/second	

CGA=Contact Guard Assist, MIA=Minimal Assist, MOA=Moderate Assist, GS=Gait Speed

Response to Interventions

The patient tolerated the interventions well overall. She responded well to verbal cues during exercises and gait. As the sessions went on, the SPTs and SMT learned how to best communicate with her to get the best response and understanding. Due to her cognitive limitations, the patient did best with simple instructions and a demonstration. She improved with more repetitions of an exercise or intervention as she became accustomed to the movement and instructions. This improvement with repetition was noted within the first few sessions. The SPTs

and SMT decided to do more repetitions of the interventions and continue them at the following sessions before progressing to let the patient continue building on what she had learned in the previous week. The patient had difficulty with reciprocal movements, such as stepping up onto a box with alternating feet or stepping forward and then backward with the same leg. In response to this difficulty, the SMT added in verbal singing cues with her music and this greatly helped the patient with these more difficult tasks.

The patient responded very well to gait training. She was able to walk 350 feet continuously by the end of the thirteen weeks. She consistently walked 250 feet multiple times with seated rest breaks in between. During the initial evaluation, the patient asked for a seated break after 75 feet of walking.

The patient thoroughly enjoyed the inclusion of music therapy while walking and performing exercises and noticed immediately when the SMT tried to remove the music during sit-to-stands. This was done to determine how the patient would tolerate the activity without music. The patient was consistently tapping her foot to the beat while seated and swaying her head to the music. The patient responded much better to the exercises when music was used, as it seemed to keep her on task. The patient also enjoyed being able to play various instruments during her interventions such as the tambourine, paddle drums, and rhythm sticks. The SPTs and SMT utilized her love of music to motivate the patient during her interventions.

Table 3. Accomplishment of Goals

	Description	Goal Outcome
Goal 1	Patient's score on the Berg Balance Scale will improve to a 21/56 to represent significant change in balance and coordination and reduce risk of falling.	Not Met; Progress made with functional independence from MOA to MIA/CGA with tasks.
Goal 2	Patient will be able to transfer sit-to-stand with SBA to maximize independence and reduce risk of falling.	Not Met; Patient improved from MOA to MIA during sit-to-stands.
Goal 3	Patient will be able to ambulate 150 feet CGA without a rest break to improve function as a community ambulator and get from car to buildings.	**Met;** Patient ambulated up to 350 feet CGA during therapy sessions.
Goal 4	Patient's gait speed will increase to .60 m/s in order to allow her to get to the bathroom in a timely manner.	Not Met; Patient's gait speed increased to 0.59 m/s.
Goal 5	Patient's score on the SF-36 will improve to 1,975 (45% impairment) to demonstrate an improved QOL.	Not Met; Patient's score improved to 1,925.
Goal 6	Patient's time on the TUG will improve to 55.0 seconds to demonstrate significant change, increase functional mobility with transfers, coordination, and reduce her risk of falling.	**Met;** Patient's time improved to 35.34 seconds.
Goal 7	Patient's time on the five time sit-to-stand test will improve to 32 seconds in order to show improvement in functional mobility.	**Met;** Patient's time improved to 22.81 seconds.

Impairments/Limitations at Discharge

At the time of discharge, the patient continued to demonstrate impairments in cognitive function and functional mobility such as transfers, gait, and balance. Her cognitive impairments did provide limitations for this case because she had difficulty remembering instructions and tasks between sessions, so her retention of the patient education was very limited. The patient needed reminders of proper form for standing up with her arms in the prayer position each session and required multiple verbal cues for instructions and sequencing. Her cognitive function also limited our use of the HEP as she was unable to recall her completion of it. Therefore we relied on the caregivers for compliance. There were no follow-up questions or evaluations for outcomes after discharge.

CHAPTER V

DISCUSSION

Strokes are a very prevalent, well-researched neurological condition affecting millions of people, but the use of interdisciplinary care between physical therapy and music therapy has not been well studied. The writers in this case selected various interventions combining physical therapy and music therapy to improve the patient's functional independence. The patient did make progress toward all of her goals when she was re-evaluated. The most improved area for the patient was in her ambulation endurance; at the end of treatment sessions the patient was able to walk further with fewer rest breaks required. Other areas of improvement were seen in her FTSTS and TUG times. The patient also performed much better during the activities on the BBS even though her scale score did not improve quantitatively.

These findings relate to other studies found using RAS such as the article by Chouhan et al[19], which looks at gross motor function, fine motor skills, and gait/balance of patients following treatment with RAS. The patient's movements improved throughout the course of treatment, especially noted with the auditory cueing from the SMT. When the musical stimulus was taken away near the end of the course of treatment, the patient's performance was variable and she usually commented on the lack of music. When the music was applied as auditory cueing or incentive for movement, the patient seemed to perform much better on the activities.

It is believed by the student researchers of this study that using music therapy in conjunction with physical therapy treatment is beneficial. During the treatment sessions, the patient revealed to the SPTs and SMT that she was a dancer when she was younger. This history of using music and choreographing movement to it may have played a large role in why this treatment was successful with this particular patient. The music was also beneficial to motivate the patient and keep her on task. Due to her dementia, multi-step instructions were difficult for her to follow. Having the SMT provide singing and musical cues for movement was very beneficial and helped improve the productivity of the sessions.

The patient had an emotional connection to the music therapy as well. During one session, when the SMT played a song for her, the patient teared up. Hsu et al[18], found that music therapy can be an effective treatment for mood elevation in patients. The SMT wanted to go more in-depth with this and open up additional communication with the patient, but was unable to do so due to time constraints and the limited number of sessions.

Reflective Practice

There are clinical implications that can be drawn from these results. One such implication would be the use of RAS during treatment. When no music therapist is present, similar treatment can be provided by implementing a beat. Having an external source of rhythm greatly helped the patient maintain regular and smooth movements. This RAS treatment was most beneficial during gait activities, but also helped with any repeated movement that the patient would occasionally have difficulty performing. Another idea that can be applied in the clinic is adding background music. Perhaps not every patient would do as well with this additional stimulus, but with the proper patient in the right setting it can be very beneficial for motivation and enjoyment.

There were several limitations faced during the study. One limitation would be that the patient and students were only available for treatment one time per week. Another limitation was that the patient has dementia, leading to difficulty remembering to perform all components of exercises, difficulty following directions, lack of carryover between sessions, and limited compliance with her HEP.

For future studies regarding music therapy and physical therapy, there are several suggestions on how to improve the quality of the study based on limitations found in this study. One suggestion would be increasing the treatment frequency. In previous studies on RAS efficacy, the treatments were performed at least four times per week so it would be beneficial to see the outcomes if treatment was more frequent.[19] It may also be beneficial for future music therapy and physical therapy studies to have a patient that is in a more acute stage of rehabilitation. The effects seen from treating this patient with music therapy and physical therapy together may have been greater if the patient had more recently had a stroke since there would be greater possibility for neuromuscular return. Another suggestion for future studies would be comparing two groups of neurological patients in rehabilitation. One control group could be receiving physical therapy interventions with the other group receiving combined interventions with music therapy and physical therapy. This would provide new insight into how music therapy can enhance the evidence-based physical therapy interventions for clients with neurological impairments.

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APPENDIX A

UND UNIVERSITY OF NORTH DAKOTA

UND.edu

DIVISION OF RESEARCH & ECONOMIC DEVELOPMENT

Institutional Review Board
Twamley Hall, Room 106
264 Centennial Dr Stop 7134
Grand Forks, ND 58202-7134
Phone: 701.777.4279
Fax: 701.777.6708
Email: UND.irb@research.UND.edu

June 21, 2017

Principal Investigator(s):	Cindy Flom-Meland, PT, PhD, NCS
Project Title:	The Effect of Collaboration of Physical Therapy and Music Therapy for Individuals with Neurologic Health Conditions
IRB Project Number:	IRB-201706-371
Project Review Level:	Exempt 4
Date of IRB Approval:	06/21/2017
Expiration Date of This Approval:	06/20/2020

The application form and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the University of North Dakota Institutional Review Board.

If you need to make changes to your research, you must submit a Protocol Change Request Form to the IRB for approval. No changes to approved research may take place without prior IRB approval.

This project has been approved for 3 years, as permitted by UND IRB policies for exempt research. You have approval for this project through the above-listed expiration date. When this research is completed, please submit a Termination Form to the IRB.

The forms to assist you in filing your project termination, adverse event/unanticipated problem, protocol change, etc. may be accessed on the IRB website: http://und.edu/research/resources/human-subjects/

Sincerely,

Michelle L. Bowles, M.P.A., CIP
IRB Coordinator

MLB/sb

Cc: Chair, Physical Therapy

University of North Dakota Exempt Certification Form – SEPTEMBER 2015 VERSION
Research Involving Existing Records or Data

Complete this form if you are requesting permission to review existing records or conduct analysis of existing datasets.

All research with human participants conducted by faculty, staff, and students associated with the University of North Dakota, must be reviewed and approved as prescribed by the University's policies and procedures governing the use of human subjects. No activities are to be initiated without prior review and approval by the Institutional Review Board.

Please answer the following questions regarding your research. Handwritten forms are not accepted – responses must be typed.

1. **Are the data existing? Existing means the data are 'on the shelf' (i.e., they were collected prior to this research proposal).** ☒ **Yes** ☐ **No**

If you answered "No" to the above question, this research does not qualify as exempt. Please fill out and submit a "Human Subjects Review Form". If you answered "Yes", continue to question 2.

2. **Will there be any contact with the subjects?** ☐ **Yes** ☒ **No**

If you answered "Yes" to the above question, this research does not qualify as exempt. Please fill out and submit a "Human Subjects Review Form". If you answered "No", continue to question 3a.

3a. Are the data publicly available? ☐ **Yes** ☒ **No**

If you answered "No" to the above question, please continue to question 3b. If you answered "Yes", **skip** question 3b and provide the information requested below.

3b. Will the data be documented in a manner that subjects cannot be identified, either directly or through identifiers linked to the subjects (e.g., subject name, social security number, birth date, coding, etc.) ?
☒ **Yes** ☐ **No**

If you answered "No" to the above question, this research does not qualify as exempt. Please fill out and submit a "Human Subjects Review Form". If you answered "Yes", please provide the information requested below:

If the research involves the use of audio, video, digital or image recordings of subjects, this research does not qualify as exempt. Please fill out and submit a "Human Subjects Review Form".

Principal Investigator: Cindy Flom-Meland

Telephone: 701-777-4130 E-mail Address: cindy.flom.meland@med.und.edu

Complete Mailing Address: SMHS stop 9037, 1301 North Columbia Road, Depart of PT suite 321

School/College: SMHS Department: PT

Student Adviser (if applicable): _____

Telephone: _____ E-mail Address: _____

Address or Box #: _____

School/College: _____ Department: _____

*** ***All IRB applications must include a Key Personnel Listing***

Project Title: The Effect of Collaboration of Physical Therapy and Music Therapy for Individuals with Neurologic Health Conditions

Proposed Research Beginning Date: May 2017

Exempt research will be approved for 3 years from the original approval date.

Funding agencies supporting this research: None.

(A copy of the funding proposal for each agency identified above MUST be attached to this proposal when submitted.)

☐ YES or ☒ NO Does any researcher associated with this project have a financial interest in the results of this project? If yes, submit on a separate piece of paper an additional explanation of the financial interest. The Principal Investigator and any researcher associated with this project should have a Financial Interests Disclosure Document on file with their department.

☐ YES or ☒ NO Will any research participants be obtained from another organization outside the University of North Dakota (e.g., hospitals, schools, public agencies, American Indian tribes/reservations)?

☐ YES or ☒ NO Will any data be collected at or obtained from another organization outside the University of North Dakota?

If yes to either of the previous two questions, list all institutions: _____

Letters from each organization must accompany this proposal. Each letter must illustrate that the organization understands its involvement and agrees to participate in the study. Letters must include the name and title of the individual signing the letter and should be printed on organizational letterhead.

Does any external site where the research will be conducted have its own IRB? ☐ YES or ☐ NO

If yes, does the external site plan to rely on UND's IRB for approval of this study? ☐ YES or ☐ NO
(If yes, contact the UND IRB at 701 777-4279 for additional requirements)

If your project has been or will be submitted to other IRBs, list those Boards below, along with the status of each proposal.

_____ Date submitted: _____ Status: ☐ Approved ☐ Pending
_____ Date submitted: _____ Status: ☐ Approved ☐ Pending

(include the name and address of the IRB, a contact person at the IRB, and a phone number for that person)

Type of Project: Check "Yes" or "No" for each of the following.

☒ YES or ☐ NO New Project
☐ YES or ☒ NO Continuation/Renewal
☐ YES or ☒ NO Dissertation/Thesis/Independent Study
☒ YES or ☐ NO Student Research Project
☐ YES or ☒ NO Is this a Protocol Change for a previously approved project? If yes, submit a signed Protocol Change Form, along with a signed copy of this form with the changes bolded or highlighted.

Provide additional information regarding your research by responding to questions 4-11 on a separate sheet of paper.

4. **In non-technical language, briefly describe the purpose of the study and state the rationale for this research.**
5. **In non-technical language, describe the study procedures.**
6. **What is (are) the type(s) of records to be reviewed (medical records, data sets, etc.)?**
7. **Describe what data will be recorded, including the date range of the files/records you will be reviewing.**
8. **How will data be stored?**
   Note: Must state that data will be stored for a minimum of three years after data analysis is complete, or for a period of time sufficient to meet federal, state, and local regulations, sponsor requirements, and organizational policies and procedures.

9. **If data are not publicly available, please provide a letter of support from the agency, or IRB approval from the agency.**

10. **Describe procedures you will implement to protect confidentiality and privacy of participants.**

11. **If the project involves medical record information, complete the HIPAA Compliance Application and submit it with this form.**

Necessary attachments:

- ☐ Signed Student Consent to Release of Educational Record Form (students and medical residents only);
- ☐ Investigator Letter of Assurance of Compliance;
- ☐ Key Personnel Listing;
- ☐ Advertisements.

NOTE: The UND IRB requires that all key personnel involved in the research complete human subject education before IRB approval to conduct research can be granted.

****

By signing this form, I certify that the above information is accurate, and that this research will be conducted in accordance with the statements provided above. The investigators will not intervene or interact with identified research subjects in the conduct of this research project.

Cindy Flom-Meland [redacted] 6-1-17

(Principal Investigator) Date:

[redacted]

(Student Adviser) Date:

[redacted]

*****All students and medical residents must list a faculty member as a student adviser on the first page of the application and must have that person sign the application.*****

Submit the signed application form and any necessary attachments to the Institutional Review Board, 264 Centennial Drive Stop 7134, Grand Forks, ND 58202-7134; or bring it to Twamley Hall, Room 106.

4. In non-technical language, briefly describe the purpose of the study and state the rationale for this research.

The purpose of this study is to evaluate the outcomes of three clients that received collaborative physical therapy and music therapy as part of PT 590 Directed Studies course during the spring semester of 2017. The pre- and post-test results of the Readiness for Interprofessional Learning Scale (RIPLS) Questionnaire, completed by the physical therapy and music therapy students, will also be evaluated to examine any change in attitude of the students towards interprofessional learning.

5. In non-technical language, describe study procedures.

The outcome data will be reviewed, analyzed, and utilized in 2 ways. 1). To describe a model of inter-professional collaboration as a potential curriculum model 2). To analyze the outcomes of each client and to inform a potential larger study in the future.

6. What is (are) the type(s) of records to be reviewed (medical records, data sets, etc.)?

Outcome data collected at the beginning and at the end of the course for each of the clients will be reviewed and compared to observe for any improvement in function (i.e. walking parameters, balance, fall risk, quality of life)

7. Describe what data will be recorded, including the date range of the files/records you will be reviewing.

The data reviewed will be from January to April 2017. It will include outcome data from the following standard physical therapy tests: Berg Balance measure, 5 times sit to stand, timed backwards walking (including distance), Timed Up and Go, Timed Up and Go Cognitive, gait parameters (with use of GaitRite – sensor mat that measures speed, step length, stride length, etc., and quality of life).

8. How will data be stored?

The data will be stored in a locked storage area in the Department of Physical Therapy at the University of North Dakota. Records from the study will be destroyed using a paper shredder three years following the conclusion of this study.

9. If data are not publicly available, please provide a letter of support from the agency, or IRB approval from the agency.

Not applicable.

10. Describe procedures you will implement to protect confidentiality and privacy of participants

The outcome data will not be linked to any individual person; identifying information will not be utilized in any reporting procedures or written documents.

11. If the project involves medical record information, complete the HIPAA Compliance Application and submit it with this form.
Not applicable.

APPENDIX B

Tested on: **1/24/2017 2:01:11 PM**

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Avg #2 + #3

Parameters

Distance (cm)	550.3
Ambulation Time (sec)	10.37
Velocity (cm/sec)	53.1
Mean Normalized Velocity	.00

Cadence (Steps/Min)	104.1
Step Time Differential (sec)	.04
Step Length Differential (cm)	3.86
Cycle Time Differential (sec)	.01

Walk # / Footfall #	L/R	Mean(%CV)	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	2/1	2/2	2/3	2/4
Step Time (sec)	L	.596(5.0)		.581		.631		.631		.598				.581	
	R	.556(4.0)			.532		.565		.565		.582		.532		.532
Cycle Time (sec)	L	1.151(4.0)				1.163		1.196		1.163				1.113	
	R	1.157(4.0)			1.113		1.196		1.196		1.180				1.113
Swing Time (sec)	L	.349(5.0) /30.3				.382		.365		.332				.349	
/ %GC	R	.397(5.0) /34.3			.399		.415		.382		.415				.382
Stance (sec)	L	.802(5.0) /69.7		.781		.831		.831				.764		.731	
/ %GC	R	.760(5.0) /65.7	.714		.781		.814		.765				.731		.714
ngle Support (sec)	L	.397(5.0) /34.5		.399		.415		.382		.415				.382	
/ %GC	R	.349(5.0) /30.2			.382		.365		.332				.349		.349
Double Support (sec)	L	.418(9.0) /36.3		.382		.416		.449		.449				.349	
/ %GC	R	.413(8.0) /35.7			.399		.449		.433				.382		.365
Step Length (cm)	L	28.643(12.0)		32.794		26.053		26.092		33.612				27.915	
	R	32.502(9.0)			33.615		29.539		36.533		36.147		33.391		30.725
Stride Length (cm)	L	60.300(9.0)				59.671		55.678		70.455				61.357	
	R	61.719(7.0)			66.410		55.600		62.886		69.763				58.650
Base of Support (cm)	L	10.18(31.0)		9.721		9.784		5.122		8.462				16.388	
	R	10.67(27.0)			9.586		9.135		5.563				14.603		13.469
Toe In / Out (deg)	L	11(.0)		12		11		12		11				4	
	R	14(.0)			10		11		23				13		11

Normal Walk; SBA of 1

Tested on: **1/24/2017 2:01:11 PM**

Age	*Gender*	*Left LEG Right*	*Height*	*Weight*
83	F	0 0	167.64	0

Walk # / Footfall #	L/R	2/ 5	2/ 6	2/ 7	2/ 8	2/ 9	2/ 10	2/ 11
Step Time (sec)	L	.548		.581		.631		.581
	R		.582		.582		.532	
Cycle Time (sec)	L	1.080		1.163		1.213		1.113
	R		1.130		1.163		1.163	
Swing Time (sec)	L	.349		.332		.349		.332
/ %GC	R		.416		.399		.366	
Stance (sec)	L	.831		.864		.781		
/ %GC	R		.764		.797			
Single Support (sec)	L	.416		.399		.366		
/ %GC	R		.332		.349		.332	
Double Support (sec)	L	.415		.465		.415		
/ %GC	R		.432		.448		.399	
Step Length (cm)	L	29.815		27.121		30.680		23.707
	R		31.145		33.018		28.405	
Stride Length (cm)	L	60.935		58.469		63.711		52.123
	R		60.979		60.224		59.239	
Base of Support (cm)	L	9.253		11.753		10.958		
	R		10.923		9.490		12.553	
Toe In / Out (deg)	L	12		13		13		
	R		17		14		13	

Tested on: **1/24/2017 2:01:11 PM**

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	*Gender*	*Left LEG*	*Right*	*Height*	*Weight*
83	F	0	0	167.64	0

Parameters

Distance (cm)	550.3
Ambulation Time (sec)	10.37
Velocity (cm/sec)	53.1
Mean Normalized Velocity	.00

Cadence (Steps/Min)	104.1
Step Time Differential (sec)	.04
Step Length Differential (cm)	3.86
Cycle Time Differential (sec)	.01

Walk # / Footfall #	L/R	Mean(%CV)	Sample Normal Values
Step Time (sec)	L	.596(5.0)	
	R	.556(4.0)	
Cycle Time (sec)	L	1.151(4.0)	
	R	1.157(4.0)	
Swing Time (sec)	L	.349(5.0) /30.3	
/ %GC	R	.397(5.0) /34.3	
Stance (sec)	L	.802(5.0) /69.7	
/ %GC	R	.760(5.0) /65.7	
Single Support (sec)	L	.397(5.0) /34.5	
/ %GC	R	.349(5.0) /30.2	
Double Support (sec)	L	.418(9.0) /36.3	
/ %GC	R	.413(8.0) /35.7	
Step Length (cm)	L	28.643(12.0)	
	R	32.502(9.0)	
Stride Length (cm)	L	60.300(9.0)	
	R	61.719(7.0)	
Base of Support (cm)	L	10.18(31.0)	
	R	10.67(27.0)	
Toe In / Out (deg)	L	11(.0)	
	R	14(.0)	

Normal Walk; SBA of 1

Tested on: **1/24/2017 2:01:11 PM**

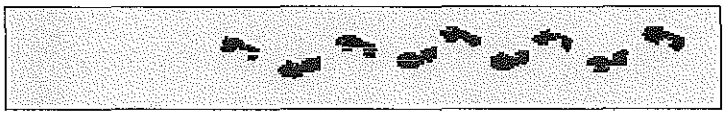
UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	*Gender*	*Left LEG*	*Right*	*Height*	*Weight*
83	F	0	0	167.64	0



Parameters

Distance (cm)	254.4
Ambulation Time (sec)	4.69
Velocity (cm/sec)	54.2
Mean Normalized Velocity	.00

Cadence (Steps/Min)	102.3
Step Time Differential (sec)	.05
Step Length Differential (cm)	4.32
Cycle Time Differential (sec)	.00

Walk # / Footfall #	L/R	Mean(%CV)	1	2	3	4	5	6	7	8	9
Step Time (sec)	L	.610(4.0)		.581		.631		.631		.598	
	R	.561(4.0)			.532		.565		.565		.582
Cycle Time (sec)	L	1.174(2.0)				1.163		1.196		1.163	
	R	1.171(2.0)			1.113		1.196		1.196		1.180
Swing Time (sec)	L	.360(7.0) /30.7				.382		.365		.332	
/ %GC	R	.403(4.0) /34.4			.399		.415		.382		.415
Stance (sec)	L	.814(4.0) /69.3		.781		.831		.831			
/ %GC	R	.769(5.0) /65.7	.714		.781		.814		.765		
ngle Support (sec)	L	.403(4.0) /34.3		.399		.415		.382		.415	
/ %GC	R	.360(7.0) /30.7			.382		.365		.332		
Double Support (sec)	L	.424(8.0) /36.1		.382		.416		.449		.449	
/ %GC	R	.427(6.0) /36.5			.399		.449		.433		
Step Length (cm)	L	29.638(14.0)		32.794		26.053		26.092		33.612	
	R	33.959(9.0)			33.615		29.539		36.533		36.147
Stride Length (cm)	L	61.935(12.0)				59.671		55.678		70.455	
	R	63.665(10.0)			66.410		55.600		62.866		69.763
Base of Support (cm)	L	8.27(26.0)		9.721		9.784		5.122		8.462	
	R	8.10(27.0)			9.586		9.135		5.563		
Toe In / Out (deg)	L	12(.0)		12		11		12		11	
	R	15(.0)			10		11		23		

Normal Walk; SBA of 1

Tested on: **1/24/2017 2:02:26 PM**

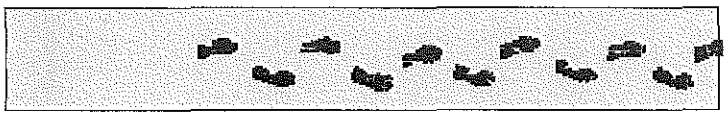
UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	*Gender*	*Left LEG*	*Right*	*Height*	*Weight*
83	F	0	0	167.64	0



Parameters

Distance (cm)	295.9
Ambulation Time (sec)	5.68
Velocity (cm/sec)	52.1
Mean Normalized Velocity	.00

Cadence (Steps/Min)	105.6
Step Time Differential (sec)	.03
Step Length Differential (cm)	3.49
Cycle Time Differential (sec)	.01

Walk # / Footfall #	L/R	Mean(%CV)	1	2	3	4	5	6	7	8	9	10	11
Step Time (sec)	L	.584(5.0)			.581		.548		.581		.631		.581
	R	.552(5.0)		.532		.532		.582		.582		.532	
Cycle Time (sec)	L	1.136(5.0)			1.113		1.080		1.163		1.213		1.113
	R	1.142(5.0)				1.113		1.130		1.163		1.163	
Swing Time (sec)	L	.342(3.0) /30.1			.349		.349		.332		.349		.332
/ %GC	R	.391(6.0) /34.2				.382		.416		.399		.366	
Stance (sec)	L	.794(7.0) /69.9	.764		.731		.831		.864		.781		
/ %GC	R	.751(5.0) /65.8		.731		.714		.764		.797			
ngle Support (sec)	L	.391(6.0) /34.4			.382		.416		.399		.366		
/ %GC	R	.342(3.0) /29.9		.349		.349		.332		.349		.332	
Double Support (sec)	L	.411(12.0) /36.2			.349		.415		.465		.415		
/ %GC	R	.405(8.0) /35.5		.382		.365		.432		.448		.399	
Step Length (cm)	L	27.848(10.0)			27.915		29.815		27.121		30.680		23.707
	R	31.337(6.0)		33.391		30.725		31.145		33.018		28.405	
Stride Length (cm)	L	59.319(7.0)			61.357		60.935		58.469		63.711		52.123
	R	59.773(2.0)				58.650		60.979		60.224		59.239	
Base of Support (cm)	L	12.09(25.0)			16.388		9.253		11.753		10.958		
	R	12.21(17.0)		14.603		13.469		10.923		9.490		12.553	
Toe In / Out (deg)	L	11(.0)			4		12		13		13		
	R	14(.0)		13		11		17		14		13	

Normal Walk; SBA of 1

Tested on: 4/25/2017 1:16:46 AM

#5

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Parameters

Distance (cm)	772.1
Ambulation Time (sec)	13.08
Velocity (cm/sec)	59.0
Mean Normalized Velocity	.00

Cadence (Steps/Min)	100.9
Step Time Differential (sec)	.04
Step Length Differential (cm)	5.16
Cycle Time Differential (sec)	.01

Walk # / Footfall #	L/R	Mean(%CV)	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	2/1	2/2	2/3	2/4	2/5
Step Time (sec)	L	.616(6.0)			.664		.614		.564				.631		.598
	R	.576(7.0)		.599		665		.589		.582		.580		.598	
Cycle Time (sec)	L	1.196(5.0)			1.263		1.279		1.163				1.229		1.196
	R	1.189(5.0)				1.329		1.213		1.146				1.229	
Swing Time (sec)	L	.392(11.0) /32.8			.415		.398		.315				.465		399
/ %GC	R	.414(10.0) /34.8				.465		.449		.382				.465	
Stance (sec)	L	.804(6.0) /67.2	.848		.881		.848				.764		.797		.831
/ %GC	R	.775(6.0) /65.2		864		.764		.764				.764		.764	
Single Support (sec)	L	.414(10.0) /34.6			.465		.449		.382				.465		.416
/ %GC	R	.392(11.0) /33.0		415		396		315				.465		.399	
Double Support (sec)	L	.384(12.0) /32.1			.416		.399		449				.332		.415
/ %GC	R	.392(13.0) /33.0		.449		.366		449				.299		.365	
Step Length (cm)	L	32.279(17.0)			28.787		31.321		29.273				40.202		42.620
	R	37.441(11.0)		39.574		35.949		35.265		34.189		44.597		41.661	
Stride Length (cm)	L	70.269(13.0)			68.364		67.442		64.561				84.841		84.517
	R	69.153(13.0)				64.629		66.690		63.477				82.049	
Base of Support (cm)	L	11.02(42.0)			4.316		9.170		13.402				5.238		9.796
	R	10.83(42.0)		5.741		4.991		11.623				9.324		5.639	
Toe In / Out (deg)	L	10(.0)			10		13		5				5		12
	R	16(.0)		17		25		18				15		22	

normal walking no musicTrial 2

Avg of 3 walks

Tested on: 4/25/2017 1:16:46 AM

UND-PT
501 North Columbia Rd
Tel# 7017773861
Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Parameters

Distance (cm)	234.4
Ambulation Time (sec)	4.29
Velocity (cm/sec)	54.6
Mean Normalized Velocity	.00

Cadence (Steps/Min)	97.9
Step Time Differential (sec)	.00
Step Length Differential (cm)	6.45
Cycle Time Differential (sec)	.01

Walk # / Footfall #	L/R	Mean(%CV)	Sample Normal Values
Step Time (sec)	L	.614(8.0)	
	R	.611(6.0)	
Cycle Time (sec)	L	1.235(5.0)	
	R	1.229(5.0)	
Swing Time (sec)	L	.376(14.0) /30.4	
/ %GC	R	.432(10.0) /35.2	
Stance (sec)	L	.859(2.0) /69.6	
/ %GC	R	.797(7.0) /64.8	
Single Support (sec)	L	.432(10.0) /35.0	
/ %GC	R	.376(14.0) /30.6	
Double Support (sec)	L	.421(6.0) /34.1	
/ %GC	R	.421(11.0) /34.3	
Step Length (cm)	L	29.794(5.0)	
	R	36.244(6.0)	
Stride Length (cm)	L	66.789(3.0)	
	R	64.995(2.0)	
Base of Support (cm)	L	8.96(51.0)	
	R	7.52(50.0)	
Toe In / Out (deg)	L	9(.0)	
	R	20(.0)	

normal walking no musicTrial 2

Single walk

Tested on: 4/25/2017 1:24:04 AM

#6

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Parameters

Distance (cm)	496.2
Ambulation Time (sec)	9.29
Velocity (cm/sec)	53.4
Mean Normalized Velocity	.00

Cadence (Steps/Min)	84.0
Step Time Differential (sec)	.08
Step Length Differential (cm)	7.11
Cycle Time Differential (sec)	.02

Walk # / Footfall #	L/R	Mean(%CV)	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	2/1	2/2	2/3	2/4	2/5
Step Time (sec)	L	.673(5.0)			.731		.665		.682			.648		.681	
	R	.750(9.0)		.697		.831		697		.847			.747		698
Cycle Time (sec)	L	1.412(4.0)			1.428		1.496		1.379					1.428	
	R	1.432(4.0)				1.562		1.302		1.529			1 395		1.379
Swing Time (sec)	L	.446(11.0) /31.5			515		.449		383					.465	
/ %GC	R	.562(15.0) /39 2				615		.481		698			.565		.465
Stance (sec)	L	.967(6.0) /68 5	.913		1.047		.995					.963		.914	
/ %GC	R	.870(6.0) /60.8		947		881		.831			.830		.914		814
gle Support (sec)	L	.562(15.0) /39 8			.615		.481		698			.565		.465	
/ %GC	R	445(11.0) /31 1		.515		.449		.383					.465		415
Double Support (sec)	L	.418(15.0) /29.6			.432		.516		.365			.398		.449	
/ %GC	R	.432(5 0) /30.2		.432		.432		.448					.449		.399
Step Length (cm)	L	34.341(15.0)			39.186		26 295		31 211			33.601		39.743	
	R	41.455(13.0)		40.189		41.015		33.084		38 794			45.663		41.254
Stride Length (cm)	L	74.859(12.0)			79.466		67.311		64.720					85.404	
	R	76.222(13.0)				80.320		59.605		70.467			79.255		81.258
Base of Support (cm)	L	11.38(29.0)			10.544		14.925		6.095			13.580		9.396	
	R	11.64(19.0)		10.248		12.535		13.820					13.186		8 396
Toe In / Out (deg)	L	7(.0)			7		7		3			12		3	
	R	16(.0)		15		17		12					15		20

Music only with normal walking

Avg of 3 walks

Tested on: 4/25/2017 1:24:04 AM

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Parameters

Distance (cm)	249.8
Ambulation Time (sec)	5.15
Velocity (cm/sec)	48.5
Mean Normalized Velocity	.00

Cadence (Steps/Min)	81.6
Step Time Differential (sec)	.08
Step Length Differential (cm)	6.04
Cycle Time Differential (sec)	.05

Walk # / Footfall #	L/R	Mean(%CV)	Sample Normal Values
Step Time (sec)	L	.693(5.0)	
	R	.768(11.0)	
Cycle Time (sec)	L	1.434(4.0)	
	R	1.484(4.0)	
Swing Time (sec)	L	.449(15.0) /31.3	
/ %GC	R	.598(18.0) /40.3	
Stance (sec)	L	.985(7.0) /68.7	
/ %GC	R	.886(7.0) /59.7	
Single Support (sec)	L	.598(18.0) /41.7	
/ %GC	R	.449(15.0) /30.3	
Double Support (sec)	L	.437(17.0) /30.5	
/ %GC	R	.437(2.0) /29.4	
Step Length (cm)	L	32.231(20.0)	
	R	38.271(9.0)	
Stride Length (cm)	L	70.499(11.0)	
	R	70.131(15.0)	
Base of Support (cm)	L	10.52(42.0)	
	R	12.20(15.0)	
Toe In / Out (deg)	L	6(.0)	
	R	15(.0)	

Music only with normal walking

single walk

Tested on: 4/25/2017 1:24:44 AM

#7

UND-PT

501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

Parameters

Distance (cm)	434.8
Ambulation Time (sec)	7.71
Velocity (cm/sec)	56.4
Mean Normalized Velocity	.00

Cadence (Steps/Min)	85.6
Step Time Differential (sec)	.04
Step Length Differential (cm)	3.91
Cycle Time Differential (sec)	.04

Walk # / Footfall #	L/R	Mean(%CV)	1/1	1/2	1/3	1/4	1/5	1/6	1/7	2/1	2/2	2/3	2/4	2/5	2/6
Step Time (sec)	L	.678(6.0)		.648		.631		.698				.681		.731	
	R	.720(17.0)			.615		.748		.548		.831		.715		.664
Cycle Time (sec)	L	1.413(8.0)				1.246		1.446				1.512		1.446	
	R	1.376(8.0)			1.263		1.379		1.246				1.366		1.595
Swing Time (sec)	L	.461(11.0) /32.6				.399		.482				.448		.515	
/ %GC	R	.529(23.0) /38.4			.416		.565		.399				.565		698
Stance (sec)	L	.952(9.0) /67.4		.847		964				1.084		.931			
/ %GC	R	847(4.0) /61.6	647		.814		.847				831		.897		
gle Support (sec)	L	.529(23.0) /37.4		.416		.565		399				.565		698	
/ %GC	R	.461(11.0) /33.5			.399		.482				.448		.515		
Double Support (sec)	L	.379(11.0) /26.8		.431		.399		.315				.366		.382	
/ %GC	R	.365(5.0) /26.1			.415		.365				.383		.382		
Step Length (cm)	L	37.396(9.0)		38.204		37.438		38.274				31.733		41.332	
	R	41.303(6.0)			37.987		43.003		41.821		40.530		40.069		44.409
Stride Length (cm)	L	77.919(8.0)				75.574		82.022				72.395		81.694	
	R	78.963(7.0)			76.198		80.707		80.210				71.959		85.742
Base of Support (cm)	L	10.81(41.0)		11.175		3.651		13.553				15.100		10.556	
	R	9.95(34.0)			9.292		5.893				10.535		14.089		
Toe In / Out (deg)	L	6(.0)		2		5		6				9		6	
	R	20(.0)			13		20				24		13		

Music with singing (voice)

Avg of 3 walks

Tested on: 4/25/2017 1:24:44 AM

UND-PT

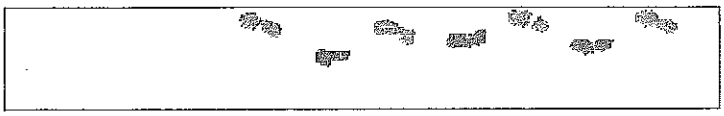
501 North Columbia Rd

Tel# 7017773861

Grand Forks ND 58202-9037

Age	Gender	Left LEG	Right	Height	Weight
83	F	0	0	167.64	0

#7



Parameters

Distance (cm)	236.7	Cadence (Steps/Min)	92.5
Ambulation Time (sec)	3.89	Step Time Differential (sec)	.02
Velocity (cm/sec)	60.9	Step Length Differential (cm)	2.97
Mean Normalized Velocity	.00	Cycle Time Differential (sec)	.05

Walk # / Footfall #	L/R	Mean(%CV)	Sample Normal Values
Step Time (sec)	L	.659(5.0)	
	R	.637(16.0)	
Cycle Time (sec)	L	1.346(10.0)	
	R	1.296(11.0)	
Swing Time (sec)	L	.441(13.0) /32.8	
/ %GC	R	.460(20.0) /35.5	
Stance (sec)	L	.906(9.0) /67.3	
/ %GC	R	.836(2.0) /64.5	
Single Support (sec)	L	.460(20.0) /34.2	
/ %GC	R	.441(13.0) /34.0	
Double Support (sec)	L	.382(16.0) /28.4	
/ %GC	R	.390(9.0) /30.1	
Step Length (cm)	L	37.972(1.0)	
	R	40.937(6.0)	
Stride Length (cm)	L	78.798(6.0)	
	R	79.038(3.0)	
Base of Support (cm)	L	9.46(55.0)	
	R	7.59(32.0)	
Toe In / Out (deg)	L	4(.0)	
	R	21(.0)	

Music with singing (voice) Single walk

APPENDIX C

Berg Balance Scale

The Berg Balance Scale (BBS) was developed to measure balance among older people with impairment in balance function by assessing the performance of functional tasks. It is a valid instrument used for evaluation of the effectiveness of interventions and for quantitative descriptions of function in clinical practice and research. The BBS has been evaluated in several reliability studies. *A recent study of the BBS, which was completed in Finland, indicates that a change of eight (8) BBS points is required to reveal a genuine change in function between two assessments among older people who are dependent in ADL and living in residential care facilities.*

Description:
14-item scale designed to measure balance of the older adult in a clinical setting.

Equipment needed: Ruler, two standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft walkway

Completion:

Time: 15-20 minutes

Scoring: A five-point scale, ranging from 0-4. "0" indicates the lowest level of function and "4" the highest level of function. Total Score = 56

Interpretation:
41-56 = low fall risk
21-40 = medium fall risk
0 –20 = high fall risk

A change of 8 points is required to reveal a genuine change in function between 2 assessments.

Berg Balance Scale

Name: _____ Date: _____

Location: _____ Rater: _____

ITEM DESCRIPTION	SCORE (0-4)
Sitting to standing	_____
Standing unsupported	_____
Sitting unsupported	_____
Standing to sitting	_____
Transfers	_____
Standing with eyes closed	_____
Standing with feet together	_____
Reaching forward with outstretched arm	_____
Retrieving object from floor	_____
Turning to look behind	_____
Turning 360 degrees	_____
Placing alternate foot on stool	_____
Standing with one foot in front	_____
Standing on one foot	_____

Total _____

GENERAL INSTRUCTIONS

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

Berg Balance Scale

SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hand for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or stabilize
( ) 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding on.
( ) 4 able to stand safely for 2 minutes
( ) 3 able to stand 2 minutes with supervision
( ) 2 able to stand 30 seconds unsupported
( ) 1 needs several tries to stand 30 seconds unsupported
( ) 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
( ) 4 able to sit safely and securely for 2 minutes
( ) 3 able to sit 2 minutes under supervision
( ) 2 able to able to sit 30 seconds
( ) 1 able to sit 10 seconds
( ) 0 unable to sit without support 10 seconds

STANDING TO SITTING
INSTRUCTIONS: Please sit down.
( ) 4 sits safely with minimal use of hands
( ) 3 controls descent by using hands
( ) 2 uses back of legs against chair to control descent
( ) 1 sits independently but has uncontrolled descent
( ) 0 needs assist to sit

TRANSFERS
INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 4 able to transfer safely with minor use of hands
( ) 3 able to transfer safely definite need of hands
( ) 2 able to transfer with verbal cuing and/or supervision
( ) 1 needs one person to assist
( ) 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
( ) 4 able to stand 10 seconds safely
( ) 3 able to stand 10 seconds with supervision
( ) 2 able to stand 3 seconds
( ) 1 unable to keep eyes closed 3 seconds but stays safely
( ) 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding on.
( ) 4 able to place feet together independently and stand 1 minute safely
( ) 3 able to place feet together independently and stand 1 minute with supervision
( ) 2 able to place feet together independently but unable to hold for 30 seconds
( ) 1 needs help to attain position but able to stand 15 seconds feet together
( ) 0 needs help to attain position and unable to hold for 15 seconds

Berg Balance Scale continued...

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
( ) 4 can reach forward confidently 25 cm (10 inches)
( ) 3 can reach forward 12 cm (5 inches)
( ) 2 can reach forward 5 cm (2 inches)
( ) 1 reaches forward but needs supervision
( ) 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.
( ) 4 able to pick up slipper safely and easily
( ) 3 able to pick up slipper but needs supervision
( ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
( ) 1 unable to pick up and needs supervision while trying
( ) 0 unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. (Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.)
( ) 4 looks behind from both sides and weight shifts well
( ) 3 looks behind one side only other side shows less weight shift
( ) 2 turns sideways only but maintains balance
( ) 1 needs supervision when turning
( ) 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)
( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds
( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding on.
( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold ≥ 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36)

About: The SF-36 is an indicator of overall health status.

Items: 10

Reliability: Most of these studies that examined the reliability of the SF_36 have exceeded 0.80 (McHorney et al., 1994; Ware et al., 1993). Estimates of reliability in the physical and mental sections are typically above 0.90.

Validity: The SF-36 is also well validated.

Scoring:
The SF-36 has eight scaled scores; the scores are weighted sums of the questions in each section. Scores range from 0 - 100
Lower scores = more disability, higher scores = less disability
Sections:

- Vitality
- Physical functioning
- Bodily pain
- General health perceptions
- Physical role functioning
- Emotional role functioning
- Social role functioning
- Mental health

References:

McHorney CA, Ware JE, Lu JFR, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36®): III. tests of data quality, scaling assumptions and reliability across diverse patient groups. *Med Care*1994; 32(4):40-66.

Ware JE, Snow KK, Kosinski M, Gandek B. *SF-36® Health Survey Manual and Interpretation Guide*. Boston, MA: New England Medical Center, The Health Institute, 1993.

Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36®): I. conceptual framework and item selection. Med Care 1992; 30(6):473-83.

Medical Outcomes Study Questionnaire Short Form 36 Health Survey

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Thank you for completing this survey! For each of the following questions, please circle the number that best describes your answer.

1. In general, would you say your health is:	
Excellent	1
Very good	2
Good	3
Fair	4
Poor	5
2. Compared to one year ago,	
Much better now than one year ago	1
Somewhat better now than one year ago	2
About the same	3
Somewhat worse now than one year ago	4
Much worse now than one year ago	5

3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?
(Circle One Number on Each Line)

	Yes, Limited a Lot (1)	**Yes, Limited a Little (2)**	**No, Not limited at All (3)**
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3

g. Walking **more than a mile**	1	2	3
h. Walking **several blocks**	1	2	3
i. Walking **one block**	1	2	3
j. Bathing or dressing yourself	1	2	3

4. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?
(Circle One Number on Each Line)

	Yes (1)	**No (2)**
a. Cut down the amount of time you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the **kind** of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

5. During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?
(Circle One Number on Each Line)

	Yes	**No**
a. Cut down the amount of time you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Didn't do work or other activities as **carefully** as usual	1	2

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?	
Not at all	1
Slightly	2
Moderately	3
Quite a bit	4
Extremely	5

7. How much bodily pain have you had during the past 4 weeks?	
None	1
Very mild	2
Mild	3
Moderate	4
Severe	5
Very severe	6
8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?	
Not at all	1
A little bit	2
Moderately	3
Quite a bit	4
Extremely	5

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. **(Circle One Number on Each Line)**

9. How much of the time during the **past 4 weeks** . . .

	All of the Time	**Most of the Time**	**A Good Bit of the Time**	**Some of the Time**	**A Little of the Time**	**None of the Time**
a. Did you feel full of pep?	1	2	3	4	5	6
b. Have you been a very nervous person?	1	2	3	4	5	6
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d. Have you felt calm and peaceful?	1	2	3	4	5	6
e. Did you have a lot of energy?	1	2	3	4	5	6

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
f. Have you felt downhearted and blue?	1	2	3	4	5	6
g. Did you feel worn out?	1	2	3	4	5	6
h. Have you been a happy person?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? (Circle One Number)	
All of the time	1
Most of the time	2
Some of the time	3
A little of the time	4
None of the time	5

11. How TRUE or FALSE is each of the following statements for you. (Circle One Number on Each Line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

APPENDIX D

Home Exercise Program for Thorey
Perform 2x/Day

Marching In Place

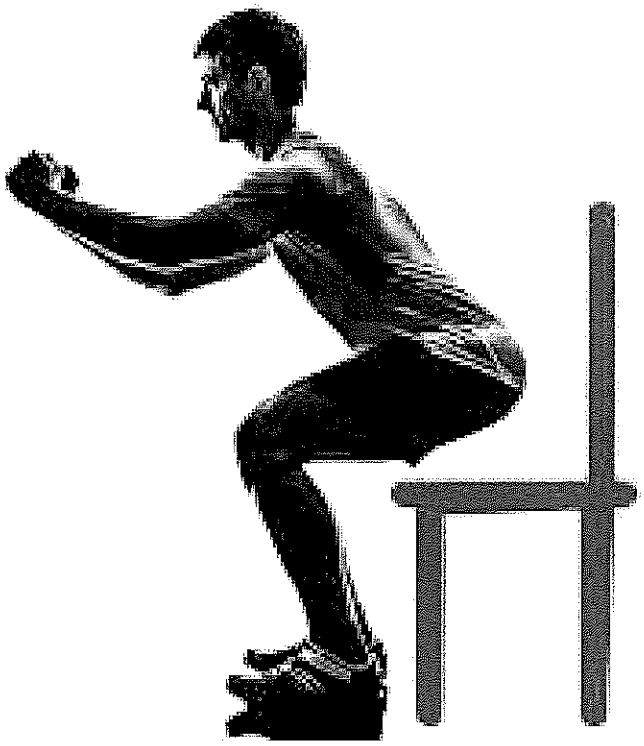
-Hold onto counter for support

-Stand up TALL

- March by bringing knees up high and then switch legs

-30 seconds, rest, repeat

Sit to Stand



-Scoot to edge of chair

-Bring Feet Back

- Clasp hands in "Prayer Position"

-Lean shoulders forward and push arms forward

-Lift hips off chair

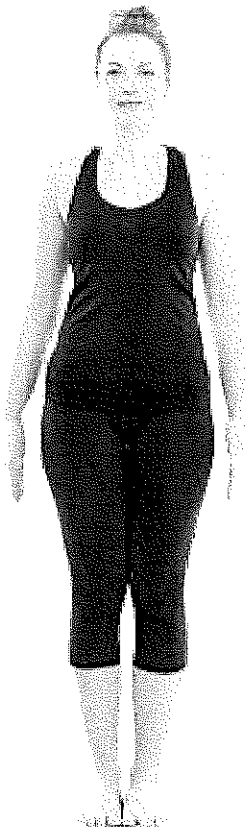
-Stand up straight and tall, looking in front of you.

-Reach back for chair and **SLOWLY** lower to sitting position

-Repeat

-5 stands x 3 sets

Standing



-Stand in corner with back to wall

-Move feet together so they are touching.

-Stand with feet close together for up to 30 secs

-Close eyes if you feel comfortable

-Repeat 3 times.

Reaching Forward

-Stand in front of kitchen counter

-With <u>BOTH</u> feet on ground reach Right arm forward as far as you can

-Return to standing TALL

-Reach forward with Left hand using Right hand to assist

5x each hand, repeat